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METAMORPHOSES OF LEPIDOPTERA

FROM SAN PAULO, BRAZIL,

IN THE FREE PUBLIC MUSEUM, LIVERPOOL.

BY

E. DUKINFIELD JONES, C.E.,

CORRESPONDING MEMBER, LIT. AND PHIL. SOC., L'POOL.

WITH NOMENCLATURE AND DESCRIPTIONS OF NEW FORMS

By FREDERIC MOORE, F.Z.S.

AND

AN INTRODUCTORY NOTE

By T. J. MOORE, C.M.Z.S.L.,

CURATOR OF THE MUSEUM.

Ser. 1-2.

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Proc Lit. & Philos. Soc. Liverpool, vol. 36. 1882.
pp 327-377

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INTRODUCTORY NOTE.

Some few years since Mr. Dukinfield Jones, a young Civil Engineer of Liverpool, called at the Museum for the purpose of naming a small collection of Moths and Butterflies which he had collected during a recent professional visit to Brazil. Calling to mind the numerous collections of a similar kind brought home by travellers or sent from the country for mere trade purposes, I took the liberty of suggesting to him, that instead of confining his attention, on his proposed return to Brazil, to procuring and preserving Lepidoptera in their perfect state, he would obtain much more satisfactory results by collecting and studying their metamorphoses. The occupation would be in itself far more interesting, with much greater promise of additions to knowledge.

This seed of suggestion fell on good ground, as shown by his papers in the *Proceedings of the Literary and Philosophical Society of Liverpool.* The present communication is further evidence of its author's zeal and diligence in cultivating the field suggested to him; but by no means displays all that he has accomplished. In a letter dated March 13, 1881, announcing the shipment of the collection, he makes the following statement:—

"I regret that I have had to hurry greatly over the descriptions. You will probably observe that they are nothing more than dates of pupation, &c., from No. XXX, or thereabouts, to the end. I found the time was getting so short that I should not have finished them at all if I had written each as fully as I did at first. The present series

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does not profess to include more than the full-fed larva, the pupa, and the imago. I hope hereafter I may have more time to devote to the subject, and work out the changes from the egg to the perfect insect. It has been very tantalizing to me this season to have to neglect so many caterpillars from want of leisure for feeding them. And not only this, but my work, requiring me sometimes in the town and sometimes up in the hills, prevents my keeping any living creatures at either place, for they would be sure to be left without food some time or other.

"I have tried collecting specimens and transferring them to trees in the neighbourhood of my ranch, so that I could look at them without having to keep them in the house. But the results have not been satisfactory; for the larvæ were sure to get full-fed and wander away whilst I was in town.

"You will see that the Nos. of the species are not consecutive; for instance, Nos. V, VI, VIII, XI, XII, &c., do not appear. This is because I have not all the species in all three stages, having perhaps found only one specimen of the caterpillar, and kept it to work through the metamorphoses. These species I hope to send you at some future time, if I am fortunate enough to find specimens to complete the series.

"I have now worked out eighty-three species, and have some pupæ now that I am anxiously watching to see what new glory they will produce."

The present paper includes forty-six species, five of which are believed to be new to science. The total of eighty-three species worked out by the author's own unaided exertions in two or three years whilst busily engaged in laborious professional duties, compares not unfavourably with the results obtained in the same line of research conducted under the far more favourable conditions of a high official position, abundant help, artistic and otherwise, and (it is not uncharitable to suppose) the smaller amount of high-pressure

prevalent when this century was young. I allude to the instance I had in mind when I gave the advice mentioned at the commencement of this note; namely, to the collection of Metamorphoses of the Lepidoptera of Java made by the late Dr. Horsfield between the years 1813 to 1819, one of the most extensive on record, yet falling short of 200 species. (See *Catalogue of the Lepidopterous Insects in the Museum of the Hon. East India Company.* By Thomas Horsfield, M. and Ph.D., F.R.S., and Frederic Moore. Vols. 1 and 2, 1857–9. London, Wm. H. Allen & Co., wherein a large number of these metamorphoses are figured and described.)

Dr. Horsfield records in his "Catalogue" how he fitted up a large apartment adjoining his residence with breeding-cages and receptacles for chrysalides; how he went out daily in search of caterpillars, accompanied by his most intelligent native assistants, several of whom were told off to provide suitable daily food, to watch the caterpillars and their changes, and to submit them in due time and season to the draughtsman. He also relates the elaborate means taken to secure the identity of each individual through all its varied changes. Equal labour and care was in every instance required in reference to the present collection, and all had to be done by the author single-handed. To testify that it has been done with the utmost care and exactness is my bounden duty.

It remains only to state that the larva, pupa, and imago of a species when worked out was indicated by the same Roman numeral; that a separate sheet of paper was devoted to each species and bore the same number; this in the order in which the species was worked out, and having no reference to ultimate scientific arrangement. The critical determination of the species has, at the recommendation of the Rev. H. H. Higgins, been intrusted by the Library and Museum Committee to my brother, who strongly recommends that

drawings of *all* the larvæ and pupæ, and especially the new species, should be published, a luxury much to be desired, but not now, at any rate, to be indulged in. All the insects whose life-history is given in the following pages, were most kindly presented by Mr. Dukinfield Jones to this Museum, and have been carefully arranged to show the larva, pupa and imago of each species side by side.

Since this paper was first put in print, for the *Proceedings of the Literary and Philosophical Society of Liverpool*,* Mr. Jones has arrived home. He has kindly replaced a few damaged specimens in the collection by better examples; and has enabled me to correct, in this issue, the few errata which he detected in that above referred to.

T. J. MOORE,

Curator.

* Vol. XXXVI., pp. 325–377; Plates III.–VI. Other communications on Brazilian Entomology, by Mr. Jones, will be found in previous volumes.

SYSTEMATIC ARRANGEMENT.

RHOPALOCERA.

Family NYMPHALIDÆ.

Subfam. *Danainæ.*

LXII.—Danais Erippus.
XXV.—Mechanitis Lysimnia.

Subfam. *Morphinæ.*

XLI.—Morpho Hercules.
III.—Morpho Epistrophis.

Subfam. *Brassolinæ.*

XXXIV.—Brassolis Astyra.
XIX.—Opsiphanes Glycerie.

Subfam. *Acræinæ.*

XV.—Acræa Pellenea.
LXXXII.—Acræa Alalia, variety.

Subfam. *Heliconiinæ.*

LXIX.—Eueides Dianasa.

Subfam. *Nymphalinæ.*

LIII.—Junonia Cænia.
VII.—Ageronia Amphinome.

Family PAPILIONIDÆ.

Subfam. *Pierinæ.*

XXIV.—Catopsilia Philea.

Subfam. *Papilioninæ.*

XXXI.—Papilio Thoas.
XLV.—Papilio Grayi.
XXXVIII.—Papilio Evander.
XLII.—Papilio Lysithous.

Family HESPERIIDÆ.

XXI.—Pyrrhopyga Palemon.
LIV.—Goniuris Proteus.

HETEROCERA.

Family SPHINGIDÆ.

LV.—Dilophonota Ello.
LXI.—Argeus Labruscæ.
XXVIII.—Pachylia inornata.
XIII.—Sorocaba anomala.

Family CHALCOSIIDÆ.

LXXII.—Phæochlæna tendinosa.

Family ARCTIIDÆ.

XXX.—Daritis sacrifica.
XLVI.—Motada lateralis.

Family ————?

XXXIII.—Perophora albistriga.
IX.—Perophora externa.

Family NOTODONTIDÆ.

XXIX.—Aneurocampa lateralis.

Family SATURNIIDÆ.

I.—Automeris sp?
II.—Automeris Metea.
XX.—Molippa Sabina.
LXXV.—Arsenura erythrinæ.
LX.—Attacus Aurota.

Family LIMACODIDÆ.

LXVII.—Pinconia ochracea.
LXXX.—Neomiressa argentata.
LXXIX.—Narosa rufotessellata.

Family LASIOCAMPIDÆ.

IV.—Eacles Laocoon.
XVII.—Megalopyge Citri.
XXXV.—Megalopyge dorsimacula.
LXXXI.—Megalopyge sp?
XL.—Megalopyge Tharops.
XXVII.—Hydrias Deusta.

Family GLOTTULIDÆ.

LVII.—Cabralia trifasciata.

Family APAMIIDÆ.

L.—Prodenia Commelinæ.
Prodenia variolosa.

Family CALPIDÆ.

LII.—Gonodonta fulvangula.

Family REMIGIIDÆ.

LI.—Remigia mensuralis.

F. MOORE.

METAMORPHOSES OF BRAZILIAN LEPIDOPTERA

RHOPALOCERA.

Family Nymphalidæ.

Subfam. *Danainæ*.

LXII.—Danais Erippus.

Papilio Erippus, Cramer, Pap. Exot. i. pl. 3, fig. A. B. (1775).
Papilio Archippus, Fabricius, Ent. Syst. iii. p. 49 (1793).
Smith, Abbott, Ins. Georgia, i., pl. 6.

Larva. *a*, Full-fed. San Paulo, March 6, 1880.

The caterpillar feeds on a species of Asclepias, and is found full-fed at the end of February. (See fig. 1, plate VI.)

Pupa. *a*, March, 1880.

When full-fed the caterpillar suspends itself by the tail, and in that position changes to the beautiful pale green chrysalis, ornamented with a ring of gold round the abdomen and gold spots on other parts of the body.

Imago. *a*, *b*.

The butterfly appears a fortnight after the caterpillar is full-fed.

XXV.—Mechanitis Lysimnia.

Papilio Lysimnia, Fabricius, Ent. Syst. iii. i. p. 161 (1793).
Hübner, Zutr. Exot. Schmett. fig. 187–8.

Ova.

The beautiful white eggs are laid in clusters of about a

dozen on the upper surface of the leaf of a species of Solanum on which the caterpillar feeds. I have sometimes found the eggs on the underside of the leaf also.

LARVA. *a*, Full-fed. San Paulo, May 30, 1878.

Caterpillars that emerged from the egg on April 22nd, 1878, were full-fed on May 30th. The colour is a dull white with a bluish tinge, and there is an orange mark at the joints of the segments; on each side of the segments there is a long fleshy protuberance. They are very sluggish in their habits, and are to be found in clusters on the underside of the leaves of the Solanum.

PUPA. *a*, Hatched, Ap. 22; Full-fed, May 30; Imago, June 22, 1878; Pupation, 23 days.
b, *c*, May, 1878.

When full-fed the caterpillars hang themselves up by the tail in a cluster on the underside of the leaf, and one of these families of chrysalids after the change has taken place is a lovely sight. The appearance is that of pure burnished gold, which in the sunshine is dazzlingly beautiful. A couple of days before the butterfly emerges, the markings of its wings become very visible through the delicate shell of the pupa, and the latter becomes shaded with dark steel blue and the prismatic colours of tempered steel.

IMAGO. *a*, Full-fed, May 10; Imago, June 2, 1878 = 23 days.
b, ,, ,, ,, ,, ,,
c, ,, May 11; ,, June 3, ,,

The butterfly appears about three weeks after pupation. It is a very common species, and flies in shady places in woods and campos. The flight is slow and graceful, and the fly is constantly settling upon the leaves of the trees, where it stays slowly opening and shutting its wings.

Subfam. *Morphinæ.*

XLI. — Morpho Hercules.

Papilio Hercules, Dalmann, Anal. Ent. p. 40 (1823).

Larva. *a*, Full-fed. San Paulo, Dec. 20, 1878.

The caterpillars were found on the stem of a "cipo," or climber, on the Serra da Cantareira, near San Paulo, on Dec. 16th, 1878. They were in a cluster of about twenty individuals. The colour is brick-red, with tufts of black and of white hairs in rings round the segments. The black hairs are barbed, and cause a good deal of irritation if one gets them between one's fingers. The caterpillar has a disagreeable smoky sort of smell, something like that of No. III. (*Morpho Epistrophis*), but at the same time quite distinct.

Pupa. *a*, January, 1881.

On Dec. 20th some of the specimens were full-fed, and became of a dull greenish colour. They hung themselves up by the tail, and in a few days changed to the robust green chrysalis. The chrysalis is marked with a white bloom, especially on the wing-cases, which bloom easily rubs off. (See fig. 2, plate III.)

Imago. *a*, ♂ Full-fed, Dec. 20, 1878; Imago, Feb. 8, 1879 = 50 days.
b, ♂ Jan. 31, 1881. *c*, ♀ Jan. 31, 1881.
d, ♀ Feb. 12, 1881.

The splendid imagos appeared at the beginning of February, being in the pupa state about seven weeks. These grand butterflies are very common at the Cantareira, where they sail about in hundreds on a hot day. Sometimes half-a-dozen will be seen in a group, chasing one another round and round, or having a dance with one of their pearly cousins, *M. Epistrophis*.

III.—Morpho Epistrophis.

Leonte Epistrophis, Hübner, Samml. Exot. Schmett. (1816–24.)

Ova.

The eggs of this species are laid in clusters of twenty or thirty on the upper side of the leaf of the food plant, and incubate in about fifteen days.

Larva. { *a*, Full-fed. San Paulo, Dec., 1878.
b, Cast skins Dec., 1879.

After emerging from the egg, the young caterpillars are very sluggish, and apparently do not move at all for a couple of days. For some weeks after they are hatched they scarcely eat anything, and do not seem to grow at all. They lie in a cluster on the under side of the leaf, radiating from a centre, their great black heads pointing outwards and presenting a very curious appearance. They probably hybernate during the cold season, for I have found specimens at the end of July still very small. The food plants that I have found the caterpillar upon are all forest trees, two of them belonging to the Papilionaceæ.

The caterpillars are social, and hang in a cluster on a leaf of the tree quite close together, and very beautiful they look with their intricate mosaic markings and soft downy hair. At night they separate to feed, returning to the same leaf in the morning, which leaf is covered with a silken web to give security to their hold. When walking they have a curious habit of wagging the head up and down. I have noticed the same habit in other caterpillars, but the motion is generally from side to side. The object of this wagging of the head seems to be to drive the preceding caterpillar on when the brood is marching in single file to its feeding ground, or back to its resting place, for I have only observed this habit in those caterpillars that live in clusters. The whole lot of

caterpillars, walking close one after the other, wag their heads in this way to touch up the "tail" of the individual in front of each, the effect being very comical. I have found, when changing them to new food, that the only way to get them to move was to imitate this movement of the head with my finger applied to their tails. If the caterpillars were in their resting position, I could generally start the whole regiment by tickling the hindermost ones, who in their turn stirred up those in front, till they all got on the move.

The caterpillar has a very unpleasant and peculiar odour that is quite indescribable. The mandibles are very powerful, and are capable of giving a severe bite if their owner is annoyed. In eating, the noise of the crunching of the leaves is considerable.

When full-fed the caterpillar hangs itself up by the "tail," the size diminishes, and the bright colours become dull and suffused with a greenish grey colour. They are full-fed in December.

Pupa. { *a*, In spirit, immediately after change.
b, Dry. Full-fed Dec. 12, 1877. Imago, Jan. 23, 1878 = 42 days.

Pupation takes place three days after the larva is full-fed. The pupa is of a beautiful bright green, the venation of the wings, etc., being of a darker shade. The insect remains in this state for six weeks.

Imago. { *a*, ♂, Feb., 1879.
b, ♂, Full-fed, Jan.; Imago, Feb. 7, 1879.
c, ♀, Feb., 1879.
d, ♀, Full-fed, Dec. 30, 1878; Imago, Feb. 8, 1879 = 40 days.

These exquisite butterflies begin to make their appearance at the end of January, but do not appear in large quantities till the middle of February; the earlier specimens

are all males. From the middle of February till the end of March the woods about San Paulo literally swarm with these lovely insects; sometimes four or five will be seen circling round and round, or lazily flapping their great pearly wings in the bright sunshine, rather sailing than flying. By the end of April they have all disappeared.

There is only one brood of this butterfly in the year.

Subfam. *Brassolinæ*.

XXXIV.—Brassolis Astyra.

Brassolis Astyra, Godart, Enc. Meth. ix., p. 457 (1823). Boisd. Spec. Gén. Lep. i., pl. 13, fig. 2. Doubleday and Hewits, D. Lep. pl. 59, fig. 1.

Castnia Langsdorfii, Ménetries, Nouv. Mem. Mosc. i., p. 192, pl. 5 (1829).

Larva. { *a*, Full-fed, San Paulo, Oct., 1878.
b, Taken from web lining flower spathe of species of palm. The web contained over four hundred caterpillars.

The caterpillar is social, living in a web spun either in the flower spathe or amongst the leaves of a species of palm. The number of individuals in one web is sometimes enormous. I have found a web spun across a flower spathe containing, as above, over four hundred caterpillars. In the day time they are to be found closely packed within the web, which is very thick and impervious to rain, and at night they pour out and feed. I have seen large palm trees completely stripped of their leaves by this caterpillar. It is full-fed at the end of October and beginning of November.

Pupa. *a*, Full-fed, Oct. 17, 1878; Imago,

When full-fed the caterpillar descends the palm-tree, and

searches for a convenient spot for undergoing the change, such as the underside of the branch of a tree, the coping of a wall, etc. It then spins the web ready to hook on to when changed to the pupa state, and remains for three or four days attached by the anal and last pair of abdominal legs; it then leaves-go with the abdominal and hangs by the anal legs alone for one or two days, when it changes to the chrysalis. (See fig. 3, plate III.)

Imago. *a*, *b*, *c*, Dec. 5–14, 1877.

The butterfly makes its appearance at the beginning of December. It is crepuscular in its habits, never flying till about sunset. The flight is powerful and rapid. Groups of five or six males and one female may often be seen flying backwards and forwards, and occasionally settling on a branch of a tree.

There is only one brood of this butterfly in the year.

XIX.—Opsiphanes Glycerie.

Papilio Glycerie, Fabricius, Mant. Ins. ii., p. 36 (1787). Clerck, Icones, pl. 34, fig. 3, 4, ♀.

Potamis S. Cassiæ, Hübner, Samml. Exot. Schmett., pl. 75, f. 3, 4, ♀.

Larva. { *a*, Full-fed specimen and one other. San Paulo, April 10, 1878.

This extraordinary caterpillar feeds on the leaves of the banana. In the first stage it is pale yellow, with black head covered with curious flat hairs, and the diverging horns on the last segment are also black, with a single long hair on the point. After the first change of skin, the head becomes of a pale pinkish grey colour, and is furnished with eight horny excrescences, four on each side, the four anterior ones

much shorter than the posterior. On the last segment the black appendages also change to the same colour as the head. In the last stage the caterpillar is striped longitudinally with pale blue and green, the stripes being separated from one another by narrow yellowish brown lines, and the horns on the head and last segment are greatly developed, giving the insect a very strange appearance. The caterpillar always lies close alongside of the mid-rib of the leaf, and, from its close resemblance to the colour of it, is very difficult to see at a short distance. It spins a fine white web on the leaf, to help it to hold on, and always spins a web in front of it when walking. (See figs. 4, 5, plate III.)

Pupa. { *a*, Full-fed, April 13; Imago, May 10, 1878 = 27 days.

When full-fed, the caterpillar attaches itself to the underside of the mid-rib of the banana leaf by its anal and last pair of abdominal legs, the thorax hanging down. In this position it remains two days. The third day it lets go with the abdominal legs, and hangs by the anal ones only, or by its "tail," as it is generally expressed. At the close of the third day it changes to a pale green chrysalis, with a dot of gold on each wing-case. (See fig. 6, plate III.)

Imago. { *a*, ♀ Full-fed April 13; Imago, May 10, 1878 = 27 days.
b, ♀ April 27, 1878. *c*, ♂ April 23, 1878.

This butterfly is crepuscular in its habits, and is rarely seen flying in the daytime. The best time for it is just after sundown, when it may be seen flying in the open glades of woods, etc., settling on some elevated point, and from thence sallying forth in pursuit of its fellows. The flight is quick and powerful, and it is difficult to capture except when resting. There is a musky smell about this butterfly.

Subfam. *Acræinæ*.

XV.—Acræa Pellenea.

Actinote Pellenea, Hübner, Zutr. Exot. Schmett. fig. 741–2 (1832).

Larva. *a*, Full-fed. San Paulo, March, 14, 1878.

The caterpillars feed on several composite plants, and are very plentiful at certain times of the year. They are social in their younger stages, living in a cluster on a loose web. In the last two stages they are not exactly social, but may be found in great quantities on the same plant. The general appearance of the caterpillars is much the same in all the stages. The spines do not appear to have urticating properties. The caterpillars are very hardy, and I have often noticed them covered with hoar-frost in the early mornings in August and September. There appear to be two distinct broods in the year, but the period of any stage extends over a considerable time.

Pupa. *a*, Full-fed, Mar. 1; Imago, Mar. 13, 1878 = 12 days.

When full-fed the caterpillar suspends itself by the "tail" to the underside of a leaf or the coping of a wall or other shelter, and there undergoes pupation. (See fig. 7, plate IV.)

Imago. *a*, *b*.

Specimens full-fed 28th February, 1878, changed March 1st, and the butterflies appeared on March 13th. This fly is one of the commonest in the neighbourhood of San Paulo; sometimes the air quite swarms with them.

LXXXII.—Acræa Alalia (Variety).

Acræa Alalia, Felder, Wien. Ent. Monats. iv., p. 105 (1860).

Larva. *a*, Full-fed. San Paulo, Jan. 16, 1881.

The caterpillar was found on a large leaf, like that of the horse-radish, growing in a swamp.

PUPA. { *a*, Feb., 1881.
b, Full-fed, Jan. 17; Imago, Jan. 31, 1881 = 14 days.

The caterpillar hangs itself up by the tail to change to the pupa state.

IMAGO. *a*, ♂ *b*, ♀.

The butterfly appears fourteen days after the larva is full fed.

[NOTE.—This variety differs from a typically marked specimen in the British Museum Collection, in the forewing of both sexes having a broader medial transverse blackish area, owing to the absence of the red spot between the base of the upper and middle median veins, and the small size of the spot between the middle and lower median veins. The hindwing differs also, in having a broader medial angular transverse black area, and a broader black outer marginal band.—*F. Moore.*]

Subfam. *Heliconiinæ.*

LXIX.—EUEIDES DIANASA.

Nereis Dianasa, Hübner, Samml. Exot. Schmett. (1806–16).

LARVA. *a*, Full-fed. San Paulo, April 25, 1880.

The caterpillar feeds on a species of Passion-flower, and was found full-fed at the end of April, 1880.

PUPA. { *a*, Full-fed, April 24; Imago, May 14, 1880 = 20 days.

The caterpillar suspends itself by the tail to undergo pupation. The chrysalis is a very remarkable one, being covered with long excrescences, four of which on the back of the thorax are arranged in the form of a cross. It is also remarkable for the faculty of making a squeaking noise when annoyed. This is done by violent jerks of the abdominal rings, the sliding of one ring over the other causing the noise. The sound is very like that made by the Longicorn beetles.

Imago. { *a*, Full-fed, April 24; Imago, May 14, 1880 = 20 days.

The butterfly appears about three weeks after the caterpillar is full-fed.

Subfam. *Nymphalinæ*.

LIII.—Junonia Cœnia.

Junonia Cœnia, Hübner, Samml. Exot. Schmett. (1816-24).

Vanessa Cœnia, Boisduval & Leconte, Lep. Amer. Sept. p. 182, pl. 49.

Larva. *a*, Full-fed. San Paulo, Jan. 19, 1880.

This beautiful caterpillar feeds on a species of Anterrhinum. It is covered with branched spines springing from beautiful dark blue shiny tubercles, that sparkle in the sunshine like gems. The spines do not appear to have any venomous properties.

Pupa. *a*, Full-fed, Jan. 29; Imago, Feb. 8, 1880 = 10 days.

When full-fed the larva suspends itself by the tail, and changes to a robust, slightly spiky, chrysalis.

Imago. *a*, *b*, *c*, *d*.

The butterfly appears three weeks after the caterpillar is full-fed.

VII.—Ageronia Amphinome.

Papilio Amphinome, Linn. Syst. Nat. i. 2, p. 779 (1767). Cramer, Pap. Exot. i., pl. 54, fig e. f.

Larva. { *a*, Penultimate stage. San Paulo, March 14, 1880.
b, Full-fed. San Paulo, March 19, 1880.

I have only found this caterpillar in the penultimate and

last stages. In the former stage it is black, and is covered with spines, and has two curious horns on the head. In the last stage the colour changes, the central segments (fourth to ninth inclusive) becoming a light brown colour, beautifully marked with an intricate black pattern. The spines on these segments are of the same colour, only tipped with black; the rest of the segments remain black, and the horns on the head are much larger than in the former stage. The food plant is a climber that is plentiful in the woods and copses round San Paulo. The caterpillar is remarkably active in its habits, and gives one the idea of being in a hurry all his life. He never seems to walk, but is always on the run. In eating the same hurry is observed, as if he was afraid he would not get enough before he had to pupate. The slightest shake of the leaf or stem of the plant makes the caterpillars fall to the ground. The spines are venomous, but the poison seems weak in its effects.

Pupa. { *a*, Full-fed, Feb. 21, 1878. Imago, March 4 = 12 days.
b, San Paulo, March, 1880.

Specimens of the caterpillar in my possession were full-fed on Feb. 21st, 1878, and they suspended themselves by the "tail." On Feb. 22nd they changed into the remarkable chrysalis with the two horn-like processes on the head. These processes do not form till the pupa has emerged completely from the skin of the larva, and securely hooked itself to the silk that the larva has spun for this purpose. As soon as this is done the pupa remains perfectly still, and the horns begin to grow. They grow in the manner of a stocking being turned inside out; when half-grown the end can be distinctly observed moving up the inside. The whole operation takes place in about two minutes. The pupa is remarkable for the great difference in the colouring of individuals.

Out of ten specimens in my possession, eight were of a dark smoky colour, with green patches on the wing covers, and on the back of the thorax, while two were almost all green beneath and the dark smoke colour on the back. The horns in all the specimens were of a burnt-sienna colour, shaded with smoke. The difference in colouring does not appear to be sexual, but I am not able to state with certainty whether it is or not. (See fig. 8, pl. IV.)

Imago. *a*, *b*, *c*, *d*, March, 1880.

On March 4th the perfect insect appeared, eleven days after the larva was full-fed.

The butterfly settles on the trunks of trees in the forest with the head downwards, taking short and rapid flights every now and then, especially when other butterflies are passing, which it delights in chasing. When thus employed it often emits loud crackling sounds, very like electric sparks. It rarely flies excepting in bright sunshine.

Family Papilionidæ.

Subfam. *Pierinæ*.

XXIV.—Catopsilia Philea.

Papilio Philea, Linn. Syst. Nat. i. 2, p. 764 (1767). Cramer, Pap. Exot. ii., pl. 173, fig. e. f. Donovan, Ins. China, pl. 32, fig. 2.

Catopsilia Philea, Butler, Lep. Exot. p. 92, pl. 35, fig. 1–4 (1872).

Larva. *a*, Full-fed. San Paulo, April 20, 1878.

The caterpillar feeds on the flowers of a species of Cassia, and its colour so closely resembles that of the brilliant yellow flowers that it is impossible to detect it at a short distance. Some of the individuals have dark green tubercles in rings round the segments, others are entirely yellow. This differ-

ence in colouring does not appear to be sexual. Specimens taken in April, 1878, were full-fed on the 20th of that month.

Pupa. { *a*, Full-fed, April 23; Imago, May 14, 1878 = 21 days.

When full-fed the caterpillar attaches itself by the "tail" and a loop round the thorax to a twig or other suitable object, and next day changes to the chrysalis. The chrysalis is generally of a pale opaque greenish colour, with the veins of a lighter shade and tinged with yellow. Two of my specimens, instead of being green, were of a beautiful purplish pink, the veins being of the same colour as in the green specimens. This difference of colouring is not sexual, for one of the specimens was a male and the other a female. (See fig. 9, plate IV.)

Imago. { *a*, ♂ Full-fed, April 23; Imago, May 18, 1878 = 25 days.
b, ♂ May, 1878. *c*, ♀ June 4, 1878.
d, ♀ Full-fed, April 24; Imago, May 18, 1878 = 24 days.

The butterfly appears about three weeks after pupation. After emerging they remain a long time without attempting to fly. I have observed specimens that did not leave the spot for five days, remaining perfectly still all the time.

Subfam. *Papilioninæ*.

XXXI.—Papilio Thoas.

Papilio Thoas, Linn. Mant. Plant. p. 536 (1771), Drury, Illust. Exot. Ent. i., pl. 22, fig. 1, 2 (1773). Cramer, Pap. Exot. ii., pl. 167, fig. A. B.

Ova.

The eggs are laid singly on the upper surface of the young

leaves of the orange, on which the caterpillar feeds. They are spheroidal in shape, and dull orange colour.

Larva. *a*, Full-fed. San Paulo, April 20, 1878.

The strange-looking caterpillar is very sluggish in its habits, remaining for hours on the leaf without moving. It has a shiny skin that gives it the appearance of being wet, and is clammy to the touch. When annoyed it protrudes two bright orange-coloured tentacles from the prothoracic segment, which have a pungent and disagreeable odour, a tiny drop of colourless liquid forming at the end of each tentacle. The odour of the liquid is so strong that if it gets upon one's hands it takes a good deal of washing to get rid of it.

Pupa. *a*, Full-fed, March 23, 1878.

When full-fed the caterpillar fixes itself by the "tail" and by a loop round the thorax to a branch of the tree, the head being uppermost, and in that position it changes to the remarkable chrysalis resembling a rotten twig broken off short.

Imago.

a, ♂	Full-fed, Ap. 30;	Imago, Sep. 29, '78 = 152 dys.			
b,	,,	,, 23	,,	Oct. 20, '78 = 180	,,
c,	,,	,, 23	,,	,, 25, '78 = 185	,,
d,	,,	,, 30	,,	,, 26, '78 = 179	,,

Specimens full-fed in April, 1878, produced butterflies in August, September, and October. There appear to be two broods in the year.

XLV.—Papilio Grayi.

Papilio Grayi, Boisduval, Spec. Gén. Lep. i., p. 365 (1836). Chenu, Encycl. Pap. pl. 16, fig. 2 (1857).

Larva. *a*, Full-fed. San Paulo, April 10, 1879.

In the early stages this caterpillar closely resembles that

of No. XXXI, *Papilio Thoas;* but after the last change of skin the appearance is quite altered. In this stage it is very handsome. The colour of the back is a sort of sage green. On the third segment is a crescent of brown having several beautiful purplish crimson spots; on the ninth segment two bands of the same brown colour cross one another on the back, and are dotted with purplish crimson. There are dots of the same colour along the sides. The caterpillar possesses a pair of scent organs, which are protruded when it is annoyed. (See fig. 10, plate IV.)

Pupa. *a*, April, 1880.

Specimens in my possession were full-fed 10th April, 1879, and they attached themselves to the sides of the box in the same manner as No. XXXVIII, *Papilio Evander*, the chrysalis of which species they much resemble.

Imago. { *a*, ♂ Full-fed, Ap. 8; Imago, Sept. 22, 1879 = 167 days. *b*, Feb., 1878; *c*, —.

The butterfly appears in September, being more than five months in the pupa state.

XXXVIII.—Papilio Evander.

Papilio Evander, Godart, Encycl. Méth. ix., p. 32 (1819). Swainson, Zool. Illust. ii., pl. 101. Boisd. Spec. Gén Lep. i., p. 277.

Larva. *a*, Full-fed. San Paulo, Jan. 1, 1879.

I found a cluster of forty or fifty of these caterpillars on the trunk of a Tangierine orange tree on December 30th, 1878. At night they separated to feed, returning to the same spot next day. The scent organ is very large, and the odour very strong. I observed that the caterpillar had the faculty of even flinging a tiny drop of fluid from the ends of

the organs on to my finger when I touched its back. The fluid has a very disagreeable and pungent smell, and it takes more than one good scrub with soap and water to get rid of it. On 1st January, 1879, more than half the cluster had disappeared, and I captured about a dozen specimens.

Pupa. *a*, Jan., 1879.

The same day that I captured the caterpillars some of them fixed themselves to the sides of the box I kept them in, and the next day they changed to the chrysalis, resembling a rotten twig of the orange; but curiously enough I did not find a single chrysalis on the tree on which the caterpillars were feeding, nor on any of the surrounding trees. They must have dispersed to a considerable distance.

Imago. { *a*, Full-fed, Jan. 3; Imago, Jan. 27, 1879 = 24 dys.
{ *b*, ,, Jan. 2; ,, Jan. 25, 1879 = 23 dys.

On January 24th the first butterfly made its appearance, having been three weeks in the pupa state.

XLII.—Papilio Lysithous.*

Hectorides Lysithous, Hübner, Samml. Exot. Schmett. (1816–41).

Larva. *a*, Full-fed. San Paulo, Jan. 4, 1880.

The caterpillar feeds on the leaves of the "Araticu" (Rollinia?), and is very sluggish in its habits, spending nearly all its time perfectly still in the centre of a leaf. It possesses scent organs on the prothoracic segment, but it requires a good deal of irritation to make it exert them. The smell is not so strong as that of Nos. XXXI and XXXVIII, *Papilio Thoas* and *P. Evander*.

Pupa. *a*, Full-fed, Jan. 4; Imago, Jan. 22, 1880 = 18 days.

* Papilio Lysithous is the Papilio whose metamorphoses are described and figured in the *Proc.* Lit. & Phil. Soc., L'pool, for 1879-80, Vol. XXXIV., p. lxv.; plate 1; the species not having then been ascertained.

The pupa is attached by its "tail" and a loop round the thorax to a twig of the tree, and from its position and colour (green, with a few rusty markings,) it looks remarkably like a little fruit. The time passed in the pupa state varies considerably.

Imago. { *a*, Full-fed, Jan. 4; Imago, Jan. 22, 1880 = 18 days.
{ *b*, Do. Oct. 9, 1878; ,, Feb. 24, 1879 = 138 ,,

Specimens full-fed in October appeared as perfect insects in February. Others, full-fed in January, produced butterflies in February. I have found full-fed caterpillars at the end of February, 1881. It remains to be seen when these will produce imagos.

Family Hesperiidæ.

XXI.—Pyrrhopyga Palemon.

Papilio Palemon, Cramer, Pap. Exot. ii., pl. 131, fig. F (1779).

Hesperia Polybius, Fabr. Ent. Syst. iii., i. p. 337 (1793).
Donovan, Ins. India, pl. 51, fig. 2.

Ova.

The eggs are laid singly on the young leaves of the Guava. I have not been able to determine the time of incubation.

Larva. *a*, First, penultimate, and full-fed stages.

When the caterpillar issues from the egg it is about five millimetres in length, and is of a purplish red colour, with bright yellow bands. The first thing it does after leaving the egg is to make a house within which to retreat when not engaged in feeding; this is done by cutting out a piece of leaf seven or eight millimetres in diameter, and fixing it on to the upper surface of the leaf in such a manner as to leave a passage for ingress and egress. When it has grown sufficiently to enable it to pull the leaves themselves together and fasten them with silk, it makes its retreat in that way. From its secluded habits it is difficult to see the changes of

skin. A specimen in my possession was hatched on 25th February, 1878. On March 3rd there was a change of skin, and on March 14th another. I was not able to determine any other changes, and the caterpillar was full-fed on April 3rd. After the second (or third?) change, the larva becomes covered with a white powder, that rubs off when touched, and the whole skin becomes finally of a dull white colour.

The caterpillar remains within the leaf during the day, and only comes out to feed at night. When annoyed by the approach of any insect, it has a curious habit of wagging its head and thorax from side to side, and sometimes round and round in a circle, striking its head against the sides of its house. The noise thus made is considerable. (See fig. 11, plate IV.)

Pupa. { *a*, San Paulo. Full-fed, April 3; Imago, April 28, 1878 = 25 days.

The pupa is of a pale bluish green, and is covered with the white mealy powder. It changes within the leaf, and suspends itself by the "tail" and a band round the thorax, lying on its back in a more or less horizontal position.

Imago. *a*, *b*.

The specimen that was full-fed on April 3rd appeared as a perfect insect on April 28th, giving a dormant period of 25 days.

At the end of June, I found other caterpillars full-fed, the butterflies of which did not appear till the end of September.

LIV.—Goniuris Proteus.

Papilio Proteus, Linn. Syst. Nat. i., 2, p. 794, (1767). Smith-Abbott, Lep. Ins. Georgia, i., pl. 18. Cramer, Pap. Exot. iii., pl. 260, fig. D, E.

Ova.

The eggs are laid on the underside of the leaves of a sort

of kidney-bean. They are usually in pairs. Time of incubation not observed.

LARVA. { *a*, Larger specimen, full-fed. San Paulo, Jan. 28, 1880.

The caterpillar protects itself with a piece of the leaf, fastened down on the upper surface of the leaf during the early stages. When large enough it bends the leaves themselves together, and makes its retreat in that way. It is pale green in colour, with longitudinal stripes of yellow.

PUPA. { *a*, Full-fed, Jan. 28; Imago, Feb. 13, 1880 = 16 days.

Pupation takes place in the same way as No. XXI., *Pyrrhopyga Palemon*.

IMAGO. { *a* and *b*, Full-fed, Jan. 29; Imago, Feb. 16, 1880 = 18 days.

The butterfly appears eighteen days after the larva is full-fed. Specimens in my possession were full-fed, as above, on 29th Jan., 1880, the imagos appearing on Feb. 16th.

HETEROCERA.

Family SPHINGIDÆ.

LV.—DILOPHONOTA ELLO.

Sphinx Ello, Linn. Mus. Lud. Ulr., p. 351 (1764). Drury, Ill. Nat. Hist. i., pl. 27, fig. 3.

Dilophonota Ello, Burmeister, Abhandl. Nat. Gesellsch. Halle, p. 70 (1855).

OVA.

The egg is laid singly on the upper surface of the Mandioca leaf. It is a flattened ovoid in shape, of a pale yellow sprinkled with rusty red.

Larva. *a*, Full-fed. San Paulo, Feb. 16, 1880.

When the caterpillar issues from the egg it is about four millimetres long and pale green, with a long black horn on the last segment. The green colour is preserved through the second stage, but the length of the tail or horn is much reduced, and becomes reddish in colour. In the last stage the caterpillar is of a pinkish smoky grey, and has no horn on the last segment.

Pupa. *a*, Full-fed, Jan. 22; Imago, Feb. 18, 1880 = 27 days.

The caterpillar enters the ground to undergo pupation.

Imago. { *a*, Full-fed, Jan. 24; Imago, Feb. 22, 1880 = 29 days.

The moth appears four weeks after the larva enters the ground. I have observed it from the middle of February to the middle of March.

LXI.—Argeus Labruscæ.

Sphinx Labruscæ, Linn. Mus. Lud. Ulr. p. 352 (1764). Clerck's Icones, pl. 47, fig. 3.

Larva. { *a*, Full-fed. San Paulo, Feb., 1880.
b, Ichneumonized specimen, penultimate stage, Feb., 1880.

This caterpillar feeds on the grape vine, and is remarkable for its resemblance to a snake, in the last stage. In the penultimate stage the marking is less snake-like, and there are green patches on the sides of the 5th to 10th segments. On the last segment is a long horn, curled at the end like a pig's tail. On the last change of skin this horn disappears, and its place is taken by a shiny disk. When irritated the caterpillar vibrates the horn or the disk, and, in the latter case, the effect of the flash of reflected light is very strange.

Pupa. { *a*, Full-fed, Feb. 6; Imago, March 17, 1880 = 40 days.

The caterpillar enters the ground to undergo pupation.

Imago. { *a*, Full-fed, Feb. 22; Imago, March 28, 1880 = 35 days.
b, Full-fed, Feb. 17; changed, Feb. 22; Imago, March 24, 1880; pupation 31 days.

The exquisite moth appears five weeks after the caterpillar is full-fed. Specimens full-fed 17th February, 1880, produced imagos 24th March, as above.

This moth squeaks like a mouse when violently held in the fingers or otherwise irritated.

XXVIII.—Pachylia inornata.

Pachylia inornata, Clemens, Journ. Acad. Nat. Sci. Phil., p. 159 (1859).

Larva. { *a*, Full-fed. Colour changed before entering the ground.
b, Full-fed. San Paulo, March 23, 1879.

This caterpillar feeds on a species of Ficus, a large tree much grown about San Paulo for ornamentation. It is full-fed in March and April. When full-fed the appearance becomes very much altered by the formation of smoky-black rings round the segments, and the duller shade of the green. See fig. 12, 13, plate V.)

Pupa. { *a*, Full-fed, March 25; Imago, June 19, 1878 = 86 days.
b, July, 1878.

The change to the pupa state takes place in a loose cocoon, woven under ground, the small particles of the surrounding earth being bound into the texture. (See fig. 14, plate V.)

Imago. { *a*, ♂. *b*, ♀ Full-fed, March 28; Imago, June 25, 1878 = 89 days.

The moth thus appears very nearly three months after the caterpillar enters the ground.

XIII.—Sorocaba anomala.

Genus nov. Sorocaba. Forewing short, rather broad and triangular; exterior margin slightly sinuous; costal vein straight; cell extending half length of the wing; first subcostal emitted at one-third before end of the cell, second trifid, third being thrown off at two-thirds from its base, and fourth at one-half from third; discocellular oblique, bent outward near upper end, radial from the angle; two upper medians from end of the cell, second from near the end, and lower at one-half before the end; submedian nearly straight, with a short basal lower branch: hindwing triangular; costa extending beyond the posterior angle of forewing, exterior margin scalloped, abdominal margin long; subcostal joined to costal at a short distance beyond the base, two subcostal branches emitted beyond the cell; discocellular bent outward in the middle, radial from the angle; middle median near end of the cell, lower at more than half before the end. Body somewhat slender; head small; palpi small, porrect, pilose beneath; antennæ bipectinate; legs thickish.

Sorocaba anomala, n. sp. Pale ochreous-brown; forewing of a greyish ochreous-brown along costal area, giving it the appearance of a broad costal paler fascia; two transverse antemedial and two postmedial slender indistinct brown sinuous lines; a small brown spot at end of the cell: hindwing and body ochreous-brown. Cilia reddish-brown, edged with ochreous-white. Expanse two inches.

Larva cylindrical, smooth, very slightly attenuating anteriorly, head small; horn long, slender, smooth; of a pale yellowish olive colour; each segment, except the head, with five black transverse dorsal stripes, which are joined together at the posterior side and above the spiracle; beneath each spiracle is a longitudinal black streak and a slender streak on its anterior side; horn black tipped.

Pupa small; purplish-black, spiked at apex.

From the above description of the larva of this anomalous form of the Sphingidæ, it will be seen that in its markings it mimics the larva of a Danais, the resemblance being more fully carried out by the presence of the long slender horn. (See fig. 15, pl. VI.)

The genus Sorocaba is allied to Andriasa; Walker (Catal. VII., p. 1735); which is placed by that author amongst the Bombycidæ. It is also allied to Cressonia and Pseudo-smerinthus.—F. Moore.

LARVA. *a*, Full-fed. San Paulo, March 3, 1878.

The caterpillars of this species were found in great numbers on a shrub on the outskirts of a wood near San Paulo. The horn on the last segment moves on a sort of hinge, and when the caterpillar walks it moves the horn from side to side in a grotesque manner. When touched, the caterpillar bends the horn over towards the side the disturbance comes from. The horn is quite soft, and does not appear to have any properties of defence.

PUPA. *a*, Full-fed, March 3; Imago, March 30, 1878 = 27 days.

Pupation takes place just below the surface of the ground, a slight web, mixed with earth, being made to protect the pupa.

IMAGO. *a*, *b*.

Specimens in my possession were full-fed on 3rd March, 1878, and on 30th March the moths appeared.

Family CHALCOSIIDÆ.

LXXII.—PHÆOCHLÆNA TENDINOSA.

Phæochlæna tendinosa, Hübner, Samml. Exot. Schmett., 18, 45, fig. 89, 90; Walker, Catal. Lep. Het. B.M. ii., p. 467.

LARVA. *a*, Full-fed. San Paulo, June 12, 1880.

The caterpillar was found, full-fed, on a Papilionaceous tree on the Serra da Cantareira.

PUPA. *a*, Full-fed, June, ; Imago, July, 1880.

The pupa is attached by the "tail" to the upper surface of a leaf, the body resting on the leaf. From its position and appearance one would take it for a butterfly-pupa rather than a moth-pupa.

IMAGO. *a*, *b*, *c*, *d*.

The beautiful little moth appeared in July. It is a day-flier, and may be taken in hundreds on a hot day, drinking on sandy places at the sides of streams.

Family Arctiidæ.

XXX.—Daritis sacrifica.

Eucharia sacrifica, Hübner-Geyer, Zutr. Samml. Exot. Schmett. iii., fig. 473-4, ♀.

Taxila crucifera, Walker, Catal. Lep. Het. Brit. Mus. iii., p. 765, ♂ (1855).

Ova.

The eggs are laid in a cluster on the underside of the food plant, which is the same as that of No. IV., *Eacles Laocoon*. Eggs laid April 6th, 1878, were hatched April 21st.

Larva. *a*, Full-fed. San Paulo, July 11, 1878.

The caterpillar is social in its younger stage, but as it grows, the individuals wander about and find new feeding grounds for themselves. The appearance does not change much through the casting of skin. Specimens taken in the first stage in February, 1880, changed skin on the 9th, 14th, 20th, and 27th of that month, and were full-fed on March 6th.

Pupa. *a*,

When full-fed the caterpillar spins a light web between the stalks of the plant, or in any other convenient place, and in this undergoes pupation, which does not take place for several days after the web is spun.

Imago. *a*, ♂. *b*, ♀.
c, ♀. Full-fed, July 12; Imago, Sept. 2, 1878 = 52 days.
d, ♂. Full-fed, March 6; Imago, March 24, 1880 = 18 days.

The beautiful moth emerges from the pupa from three to seven weeks after pupation. Specimens full-fed March 6th appeared March 24th. Others, full-fed in July, did not produce the imago till September. There are several broods in the year.

XLVI.—Motada lateralis.

Motada lateralis, Walker, Catal. Lep. Het. Brit. Mus. iv., p. 924 (1855).

Larva. *a*, Full-fed. San Paulo, Nov. 1, 1879.

The caterpillar is covered with short hairs that cause a good deal of irritation if they get between one's fingers. It feeds on a yellow composite flowered plant, something like our Ragwort.

Pupa. *a*, Full-fed, Nov. 10; Imago, Nov. 29, 1879 = 19 days.

Pupation takes place within a rough cocoon.

Imago. *a*, Full-fed, Nov. 10; Imago, Nov. 29, '79 = 19 days.

Specimens full-fed 10th November, 1879, produced the moth on November 29th, as above.

Family ————?

XXXIII.—Perophora albistriga.

Pamea albistriga, Walker, Catal. Lep. Het. Brit. Mus. v., p. 1154 (1855).

Larva. *a*, Full-fed. San Paulo, February, 1881.

The caterpillar of this species lives in a movable case, beautifully formed out of the leaves of the food-plant, a herbaceous plant with beautiful purple flowers (Melastoma?). The case is slung up or rather bound up amongst the leaves

with a loose web, and can be readily moved from one place to another by the caterpillar.

Pupa.

When full-fed the caterpillar closes up the ends of the case with silk, and undergoes pupation.

Imago. { *a*, Full-fed, March 26; Imago, Oct. 12, 1878= 200 days.
b, Full-fed, March 26; Imago, Oct. 17, 1878= 205 days.

Specimens in my possession were full-fed at the end of March, 1878, and produced the moth in October, as above stated.

IX.—Perophora externa.

Perophora externa, n. sp. Male and female. Brownish grey; forewing with a transverse antemedial pale ochreous-brown angulated fascia, which also crosses the base of the hindwing; a very oblique postmedial blackish-brown line which extends to near apex, and is then acutely bent inward to the costa; this line is outwardly bordered by ochreous-brown, and followed by a submarginal brown fascia; at end of the cell is an elongated hyaline spot: hindwing with a medial transverse blackish line, continued from that on the forewing, and broadly bordered outwardly by brown. Body brownish-grey. Expanse ♂ 1¾, ♀ 2 inches.

Nearest allied to *P. orthane* and P. *vittata*, Walker. It is quite distinct from *P. sanguinolenta*, Felder.—F. Moore.

Larva. { *a*, Cases of larvæ fixed for pupation, San Paulo, Jan., 1878.
b, Full-fed. San Paulo, Dec. 11, 1877.

This caterpillar lives in a hard hammock-like case formed of the excrement, joined together with silk and mucilage. The case is suspended from the twig on which it feeds by silk threads, and is generally slung in a more or less vertical position, so that the curved end protects the upper opening from rain. Both ends of the case are alike, and the caterpillar puts his head out at either end with equal facility.

In its habits it closely resembles the allied species noticed in Proc. Lit. and Phil. Soc. of Liverpool, vol. XXXIII. p. lxxvii.

PUPA.

When full-fed the larva attaches the upper end of the case to a twig, and pupation takes place.

IMAGO. *a*, ♀ ; *b*, ♂.

Specimens in my possession were full-fed in January, 1878, and the moths appeared on 1st March.

Family NOTODONTIDÆ.

XXIX.—ANEUROCAMPA LATERALIS.

Cossus lateralis, Walker, Catal. Lep. Het. Brit. Mus. vii., p. 1520 (1856).

OVA.

The eggs are laid in a cluster round a thin twig of a species of Melastoma that is very common in swampy places round San Paulo. Time of incubation not observed.

LARVA. *a*, Full-fed. San Paulo, April 20, 1878.

I found specimens in the penultimate stage at the beginning of April, 1878. The last change of skin took place April 12th, and the caterpillars were full-fed on the 20th. (See fig. 16, pl. VI.)

PUPA. *a*, Full-fed, April 20 ; Imago, Aug., 1878.

The caterpillar enters the ground to pupate, and forms a tough cocoon, into which are woven small particles of earth.

IMAGO. *a*, Full-fed, April 20; Imago, Aug. 10, 1878 = 112 days.

The specimens full-fed on April 20th, produced the perfect insect at the beginning of August.

Family Saturniidæ.

I.—Automeris sp —— ?

Automeris sp—— ? Dull greyish sienna-brown in male, burnt sienna-red in female; forewing with a narrow transverse yellowish slightly waved antemedial band, and an oblique straight postmedial band, both bands being slenderly bordered outward with brown; a slender irregular-oval discocellular mark: hindwing with a large discal black bordered, yellow ringed, irregular circular blind ocellate patch, in the middle of which is an oval black spot, this spot being white speckled at each end, and has a contiguous white-speckled streak on each side; beyond the patch is a submarginal slender black scalloped line and a contiguous narrow red band.

Expanse ♂ 3¼, ♀ 3¾ inches.

The above is doubtless a named species, but I have been unable to identify it.—F. Moore.

Larva. *a*, Full-fed. San Paulo, Dec., 1878.

The caterpillar of this species is common in the neighbourhood of San Paulo. There appear to be several broods in the year. It feeds on a great variety of plants. I have found it on Iris, Gladiolus, Banana, Rose, Scabious, several composite plants, and many others. It is sluggish in its habits, remaining for a long time in one spot as long as it has food. The spines are very venomous, the effects of the poison when injected into the skin being very severe, causing violent pain for some hours.

Pupa. *a*, Full-fed, Jan. 1, 1878; Imago, Jan. 31 = 30 days.

Pupation takes place in a light cocoon spun between leaves or in any other convenient place.

Imago. { *a*, ♀ Full-fed, Dec. 24, 1877; Imago, Jan. 20, 1878 = 27 days.
{ *b*, ♂ Full-fed, Jan. 1, 1878; Imago, Jan. 31, 1878 = 30 days.

Specimens as above produced the perfect insect in January, 1878. Another brood was full-fed at the beginning of April,

the moths appearing at the end of that month. There is a considerable difference between the shade of the male and female, and the males also vary much in colour. I have found them almost buff and also of a deep chestnut.

II.—Automeris Metea.

Phalæna B. Metea, Cramer, Pap. Exot. iv., pl. 304, fig. A.

Larva. *a*, Full-fed. San Paulo, Dec., 1877.

This species feeds upon a Solanum that grows plentifully in waste places in the neighbourhood of San Paulo. It is a very handsome caterpillar, the body being a deep velvety black and the tufts of spines brilliant lemon yellow. The spines are very venomous, and produce violent irritation when brought in contact with the skin.

Pupa. *a*, Full-fed, Dec. 8, 1877; Imago, Jan. 11, 1878.

Specimens in my possession in December, 1877, began to spin their dark-coloured gummy cocoons on the 8th of that month between leaves of the Solanum and in the corners of the boxes. The cocoon is remarkable for the curious perforated diaphragm that closes the upper end, and through which the moth makes its escape.

Imago. { *a*, ♀ Full-fed, Dec. 8, 1877; Imago, Jan. 11, 1878 = 34 days.
{ *b*, ♂ Full-fed, Dec. 7, 1877; Imago, Jan. 8, 1878 = 32 days.

The perfect insects appeared from 31 to 33 days after beginning to spin. There is a great difference in the colour of the male and female, the former being of an ashen grey tinged with olive; while the latter is of a dull reddish brown. I noticed a second brood of this moth in the middle of April.

XX.—Molippa Sabina.

Molippa Sabina, Walker, Catal. Lep. Het. Brit. Mus. vi., p. 1345 (1855).

Larva. *a*, Full-fed. San Paulo, March 9, 1878.

The caterpillar feeds upon "*Unha de vacca*," a papilionaceous tree with large white flowers. It is gregarious in its habits. In the day time it is to be found in clusters of twenty or thirty individuals on the trunk of the tree on which it feeds. At night they ascend the tree and feed, descending in the morning to the same spot. They are beautiful caterpillars, the body being ashen grey marked with black and crimson dots. It is covered with tree-like tufts of venomous spines of a whitish colour tipped with black.

After emerging from a change of skin the caterpillar goes through a series of extraordinary contortions, apparently twisting itself into knots and then undoing them. The object of this is no doubt to unfurl the spines, which are of course quite soft and more or less crushed together as they come out of the old skin. I have observed the same contortions in many other spiny caterpillars. When full-fed the colour changes to a dark yellowish brownish grey.

Pupa. *a*, San Paulo, March, 1878.

Pupation take place within a dark brown semi-transparent cocoon spun between leaves, etc. The length of time the insect remains in the pupa state varies greatly. Some specimens that were full-fed in March, 1878, produced imagos in April; others did not appear till the middle of October.

Imago. { *a*, ♀ Full-fed, March 6; Imago, April 16, 1878 = 41 days.
{ *b*, ♂ Full-fed, March 17; Imago, Oct. 15, 1878 = 212 days.

The moth varies a good deal in colour, some specimens being shaded with a pink colour, especially in the posterior wings. When disturbed it has a habit of curling up the abdomen and erecting the wings till they nearly touch, back to back, "shamming dead."

LXXV.—Arsenura erythrinæ.

Bombyx erythrinæ, Fabricius, Spec. Ins. ii., p. 169.

Larva. *a*, Full-fed, April 11, 1880. Campinas.

I took the caterpillar on a species of Bombax, at Campinas, at the end of March, 1880. In the daytime it congregates in clusters on the branches of the tree, feeding at night. A friend in Campinas, from whose tree I took my specimens, told me he had killed hundreds of them time after time, to save the tree from being stripped of its leaves.

Pupa.

My specimens were full-fed early in April, and entered the ground to undergo pupation.

Imago. *a*, Full-fed, April 11; Imago, Sept. 13, 1880 = 155 days.

Some of the moths made their appearance in August, others in September, and I have still (March, 1881) one pupa alive.

LX.—Attacus Aurota.

Bombyx Aurotus, Fabricius, Mant. Ins. ii., p. 108.

Larva. *a*, Full-fed. San Paulo, Feb. 6, 1880.

The caterpillar of this species feeds upon a shrub that grows in damp places, usually at the sides of streams or swamps. It is of a pale green colour, with small orange-coloured tufts of spines, which do not appear to have urticating properties.

Pupa. { *a*, San Paulo, April, 1878; contains pupæ of parasitical dipterous fly.

The change to the pupa state takes place in a beautiful pendent cocoon of excellent silk. The upper end of the cocoon is attached to a leaf or twig, and the silk is continued several inches down the twig, so that the cocoon, when torn off, has a long stalk to it.

Imago. *a*.

The magnificent moth appeared on 14th March, five weeks after the caterpillar was full-fed; but I believe there are many broods of this moth in the year, and the length of time spent in the pupa state probably varies a good deal.

This moth seems very liable to the attacks of a parasitical dipterous fly, many specimens of which I have bred from the cocoons.

Family Limacodidæ.

LXVII.—Pinconia ochracea.

Genus nov. Pinconia: forewing short, broad; costa convex at the end, apex almost pointed, exterior margin very oblique and convex; subcostal slightly bent at the emission of its first branch, which starts at one-third before end of the cell, trifid, the second being thrown off above the end of the cell is bent downward and then curves upward to the apex, the third being given off near its end; fourth branch bifid, emitted from end of the cell, curving upward and touching the second, fifth from one-third beyond its base; discocellular bent inward, lower end very oblique, radial from upper end of the cell; a slender discoidal veinlet emitted within the cell from angle of the discocellular; third median (or lower radial) at an angle before end of the cell below the upper, second and first (or lower) at equal one-fifth each before the end, the two last much curved; upper and lower submedians much recurved: hindwing long, almost pyriform; costal and sub-costal apparently united to near end of the cell; discocellular very oblique, bent in the middle, upper radial from the angle, lower at half way below it; a slender discoidal veinlet emitted within the cell from below upper radial; middle median at one-half and lower at two-fifths before end of the cell; submedian and internal recurved. Body pilose; palpi small, porrect, slender; antennæ (broken); legs densely pilose.

Pinconia ochracea, n. sp. Male deep yellowish-ochreous: forewing with all the veins, except the costal, dark brownish-ochreous: hindwing slightly

brighter ochreous, veins less distinct. Thorax and legs bright ochreous. Expanse 2 inches.

This insect is allied to the genus Dalcera. It also has much the appearance of *Ammallo nervosa*, Felder, but differs considerably from the latter in both the form of wings and in their venation.—F. Moore.

Larva. *a*, Full-fed. San Paulo, April, 1880.

This remarkable caterpillar was found on the Ameixa (*Eriobotrya Japonica*) at the end of March, 1880. It is quite white and translucent, looking just as if made of Venetian glass. The abdominal legs are wanting, their place being indicated merely by slight swelling of the skin. The motion of the caterpillar when walking is exactly that of a slug, a series of waves passing along the surface of the abdomen, from the rear to the front.

Pupa. { *a*, Full-fed, April 12; Imago, May 6, 1880 = 24 days.

Pupation takes place within a cocoon, spun on the surface of a leaf or other suitable place. The cocoon is remarkable for the hexagonal hole left in the outer layer of silk in the centre of the cocoon.

Imago. { *a*, Full-fed, April 12; Imago, May 5 = 23 days.
b.

Specimens full-fed at the beginning of April, produced the perfect insect at the beginning of May. When the moth emerges, it protrudes the pupa as far as the abdomen from the cocoon, the empty shell remaining in that position.

LXXX.—Neomiressa argentata.

Nyssia argentata, Walker, Catal. Lep. Het. Brit. Mus. v., p. 1134 (1855).

Larva. *a*, Full-fed. San Paulo.

The caterpillar feeds on the orange, and was found full-

fed in April, 1880. It is a beautiful caterpillar, being blue green, with yellow mosaic pattern on the back, and four crimson spots, two on the last segment and two on the fourth segment. It is thickly covered with spines, which are extremely venomous. The appearance of the whole insect is that of Venetian glass. The abdominal legs are wanting, and the caterpillar glides along like a slug.

Pupa. *a*, Dec., 1880.

Pupation takes place in a hard, almost spherical, cocoon, spun on the upper surface of a leaf or other suitable place.

Imago. { *a*, Full-fed, April 13; Imago, Dec. 18, 1880 = 263 days.

The moths appeared in December. To emerge from the cocoon a circular trap door is cut, and the pupa partly protrudes through this.

LXXIX.—Narosa rufotessellata.

Narosa rufotessellata, n. sp. ♂ ♀. Forewing very pale yellow; crossed by seven erect blotchy-red bands, of which the basal second and outer-edge of the sixth are of a darker colour, the latter also being broadest and enclosing a similar coloured terminal spot beyond end of the cell, thus leaving a bare space before the apex: hindwing very pale red towards the inner border in male and entirely of a pale red in female; cilia pale yellow. Thorax very pale yellow, with a red collar and lower streaks; abdomen red, tuft pale yellow. Expanse ♂ $1\frac{1}{12}$, ♀ $1\frac{2}{12}$ inch.—F. Moore.

Larva. *a*, Full-fed. San Paulo, Feb. 29, 1880.

This remarkable caterpillar was found full-fed on Cedrela at the end of February, 1880. Its appearance is most grotesque. The abdominal legs are wanting, and it slides along in a slug-like manner. But instead of going steadily and smoothly it rolls from one side to the other, giving one the idea of its being drunk. From each segment project

two long brown mossy-looking protuberances, which lie in a horizontal position, giving the caterpillar the appearance of a shrivelled leaf.

PUPA. *a*, Jan., 1881.

Pupation takes place in a hard black cocoon, spun on the surface of the ground at the foot of the tree. The mossy excrescences are dropped off before the cocoon is spun, and are loosely arranged on the outside of the cocoon.

IMAGO. { *a* and *b*, Full-fed, Feb. 29; Imago, Dec 14, 1880 = 306 days.

The moths appeared in December, 1880. On emerging, the pupa is partly protruded through the opening in the cocoon.

Family LASIOCAMPIDÆ.

IV.—EACLES LAOCOON.

Phalæna B. Laocoon, Cramer, Pap. Exot. 11, pl. 117, fig. A, B, C, ♀.

Eacles princeps, Walker, Catal. Lep. Het. Brit. Mus. vi., p. 1374, ♂ (1855).

OVA.

The eggs of this species are laid singly on the upper side of the leaf of the food-plant, and there are seldom more than two or three on the same plant. The colour is a pale yellow, and the shape ovoid, flattened on the side attached to the leaf and the opposite side. The time of incubation I have not yet determined.

LARVA. *a*, Full-fed. San Paulo, Feb. 1880.

The caterpillar feeds upon a composite plant with purple flowers (Knapweed?) that grows plentifully in the campos

and waste places round San Paulo. The colour during the first stage is black, with a light brown patch in the middle segments; the spines of the anterior segments are very long, and are terminated with a curious crescent-shaped knob. With each change of skin the colour alters considerably, the black disappearing and a brown tint taking its place; the diagonal markings along the sides become more and more distinct. After the last change of skin the colour is much the same as during the penultimate stage, but lighter in shade and suffused with a pinkish grey. The spines on the anterior segments are still very long, and have a white transparent appearance and a black tip. Their resemblance to glass is remarkable. But after a few days the pinkish grey gradually changes into bright green, and the spines diminish in length and become red. The spines are venomous, and cause considerable pain when brought in contact with the skin; but the effects are not so violent as in many other species. When annoyed the caterpillar flings its head back to strike the offending object with the spines. (See fig. 17, plate V.)

Pupa. *a*, Full-fed, Dec. 7, 1877; Imago, Jan. 17, 1878.

When full-fed the caterpillar enters the ground, and there undergoes pupation.

Imago. { *a*, ♂ Full-fed, Dec. 7, 1877; Imago, Jan. 17, 1878 = 41 days.
{ *b*, — Full-fed, Nov. 30, 1880; Changed, Dec. 6; Imago, Jan. 15, 1881 = 40 days.

The moth appears about six weeks after the caterpillar enters the ground. There is a good deal of variety in the marking of specimens. In some of the females the "death's head" on the anterior wings is very distinct.

XVII.—Megalopyge Citri.

Phalæna B. Citri, Anon. Ins. Surinam, i., p. 31, pl. 12.

Podalia Citri, Walker, Catal. Lep. Het. Brit. Mus. vii., p. 1715.

Larva. *a*, Full-fed. San Paulo, March 16, 1878.

The caterpillar of this species is found, full-fed, from the middle of March to the middle of April. I have taken it on a Papilionaceous tree, called here "*Unha de Onça*," or Puma's claws; on Cedrela, Palma Christi, a species of Ficus, and on the orange. The colour of the body is a pure dead white; the tubercles, from which spring the very long dark hairs, are of a purplish pink colour. At the roots of the long hairs are tufts of venomous spines, which cause very severe pain and inflammation if brought in contact with the skin. This caterpillar and some others of the same genus are so very venomous that it is dangerous to handle them, the spines even penetrating the hard skin of the fingers or palm of the hand. Most of the other venomous caterpillars can be taken up with impunity if the spines are not allowed to come in contact with the softer skin of the back of the fingers or hand.

Pupa.

The cocoons are spun in clusters about the branches of the tree, usually at a fork, and closely resemble the bark of the tree. The outer covering is very large and loose; inside this there is a second envelope, and beneath this again is the closely woven carinated case within which the insect changes to the pupa state. Pupation does not take place for several months after the caterpillar is full-fed. In August I found the larva still unchanged, though much reduced in size. Though almost motionless when I opened the cocoon, it still had activity enough to repair the damage done.

Imago. *a*, ♀; *b*, ♂; *c*, ♀.

The moth appears in January, having been in the dormant state ten months. There is a strong and unpleasant smell about this moth.

XXXV.—Megalopyge dorsimacula.

Podalia dorsimacula, Walker, Catal. Lep. Het. Brit. Mus. vii., p. 1717 (1856).

Larva. *a*, Full-fed. San Paulo, March 1, 1878.

This caterpillar feeds upon several plants; but I have generally found it on a Melastoma (?) For description see Proc. Lit. and Phil. Soc., Liverpool, 29th April, 1878, vol. xxxii., pp. cii.–civ. and plate.*

Pupa. *a*, Full-fed, March; Imago, Oct., 1878.

Pupation takes place within a closely spun cocoon, in the outside layer of which the long red hairs of the larva are

* Mr. Dukinfield Jones modestly omits all reference to his personal experience of the extremely venomous property of the spines of the larva of this insect, as related in his communication to the Society, above referred to. To test the reputed ill character given of it by the Brazilians, he experimented on himself at 11 a.m., by pressing the back of one of these caterpillars on the back of his left hand, till he could feel the prick of the spines. In ten minutes he had violent pain and swelling on the hand, and, shortly after, pain in the armpit. All his remedial measures were ineffective, and the pain was suggestive of boring with a red-hot iron. It lasted for some hours, distressed him in the night, and left a soreness which continued to the third day. The marks of the spines, thirty-six in number, were still visible more than a fortnight after. The experiment was so very convincing that I have not heard of a repetition of it. The description of the larva is as follows. "The whole body is covered with long red-brown hairs, which grow in tufts arising from the centre of each segment, and at the base of the long hairs are bunches of venomous spines, which are quite concealed by the hairs. The body is very soft and fleshy, and of a paler colour than the hairs. There are six pairs of abdominal legs, the first and last pair, however, not being fully developed. The head is very small, and is, when eating, quite covered with a fleshy mantle, formed by the first segment of the body. When walking, the head is protruded a little."—T. J. Moore.

interwoven; at each end of the cocoon several small holes are left in the weaving. Pupation does not take place for a considerable time after the cocoon is spun.

Imago. *a*, Full-fed, March; Imago, Oct. 28, 1878.

The moth appears in October, seven months after the larva is full-fed. This moth and other allied species have a peculiar and disagreeable odour. On emergence from the cocoon, the head and thorax of the pupa are protruded, and the empty shell will be found in that position in all cases where the moth has come out.

LXXXI.—Megalopyge sp—— ?

The specimen, a female, is too much broken for identification. It has a reddish woolly body, the wings apparently grey, with indistinct blackish streaks between the veins.—F. Moore.

Larva. *a*, Full-fed. San Paulo, March 16, 1878.

The caterpillar feeds on the Cedrela, and is full-fed in March. It sometimes appears in such quantities as to strip the trees of their leaves. The body is covered with beautiful bright chestnut hairs that lie in wavy ridges down the body; round the sides the hairs are black, and two curious forked black tufts of hair arise from the ends of the caterpillar. (See fig. 18, plate VI.)

Pupa. *a*, Dec., 1880.

The cocoons are spun in great clusters on the trunk of the tree, fifty or a hundred being often found in one cluster. The outside covering is thick and woolly, and inside this is formed the hard cocoon. This is ovoid in shape, with the anterior end flattened where the trap-door is formed through which the moth makes its exit.

Imago. *a*, Full-fed, March, 1880; Imago, Dec. 17, 1880.

The moth appears in December. The head and thorax

of the pupa are protruded from the cocoon when the moth emerges.

The caterpillars seem very liable to disease, for I have observed that a great number die in the cocoon without pupation taking place.

XL.—Megalopyge Tharops.

Phalæna B. Tharops, Cramer, Pap. Exot. iv., pl. 359, fig. A. ♀.

Hydrias Tharops, Walker, Catal. Lep. Het. Brit. Mus. vi., p. 1404.

Larva. { *a*, Full-fed. San Paulo, March, 1878, and earlier stage, March, 1881.

This remarkable caterpillar feeds upon the guava tree, and is found full-fed in March and April. It is covered with long partridge-coloured hairs, which are drawn together into a grotesque curl at the posterior end of the caterpillar. The abdominal feet are very slightly developed, and the motion is more gliding than walking. At the tubercles from which the long hairs spring there are clusters of highly venomous spines, the urticating properties of which are very great. (See fig. 19, plate VI.)

Pupa. { *a*, Full-fed, March 14, 1878; Imago, Jan. 29, 1879 = 321 days.

The cocoon is remarkable for the beautiful way in which the caterpillar adapts it to the surface it has chosen for it. One specimen in my possession spun on a twig of the guava he had been feeding upon, and he arranged his cocoon so perfectly round the twig, and ornamented it with little bits of bark so well, that at a short distance it looked exactly like a thickening of the twig. Others spun on the sides of the box,

and in their case the cocoon was spread out flat. Pupation does not take place for some months after the spinning of the cocoon.

Imago. { *a*, ♂ Full-fed, March 18, 1878; Imago, Jan. 29, 1879 = 317 days.
b, ♀ Full-fed, March 15, 1878; Imago, Jan. 29, 1879 = 320 Days.

The moth appears in January, ten months after the caterpillar is full-fed.

XXVII.—Hydrias Deusta.

Hydrias Deusta, H. Schæff. Lep. Exot. Sp. Ser., pl. 19, fig. 91 (1854). Walker, Catal. Lep. Het. Brit. Mus. vi., p. 1398.

Larva. *a*, Full-fed. San Paulo, April 24, 1878.

This handsome caterpillar feeds on a shrub growing in the woods around San Paulo. The appearance is very little altered in the different stages. Specimens in my possession changed the skin 1st March, 14th and 28th March, and 8th April, being full-fed April 24th. The caterpillars are social, passing the day in a cluster on the upper surface of a leaf, and separating at night to feed.

Pupa. *a*, Full-fed, Ap. 20; Imago, June 17, '78 = 58 days.

The cocoon is spun in any convenient spot, such as a hollow in the trunk of a tree, etc., and is remarkable on account of the skin of the caterpillar being thrust out through the posterior end when pupation takes place.

Imago. *a*, ♀. *b*, ♂.

Specimens full-fed at the end of April, produced the moth at the beginning of July.

Family Glottulidæ.

LVII.—Cabralia trifasciata.

Genus nov. Cabralia. Forewing elongated, triangular; costa very nearly straight, slightly arched at apex; exterior margin obliquely convex; cell extending two-thirds length of the wing; first subcostal emitted at one-third before end of the cell; second at one-ninth, bifid; fifth from end of the cell, and touching third near its base; discocellulars from angles near end of the cell, radials from the angles; middle median from near end of the cell, lower at one-fifth before the end; submedian at a wide distance from the median: hindwing triangular; two subcostals from end of the cell; discocellular bent inward near upper end, radial from near lower end; two medians from end of the cell, lower at one-third before the end. Body rather stout; antennæ filiform; palpi porrect, compact, second joint stout, third joint small and conical; legs short, stout, slightly pilose.

Cabralia trifasciata, n. sp. Forewing with a pale pinkish-ochreous band along the costa, another down the exterior margin, and an oblique short discal band, the interspaces being grey, the bands margined with a blackish line and bordered with white: hindwing pinkish-white. Body hoary grey; thorax with a broad pinkish collar. Expanse 1 inch.

Larva black, with a few short very slender black hairs; each segment with four transverse dorsal prominent narrow yellowish stripes, which on the fifth to twelfth segments enclose the spiracle within a yellowish spot; front legs black; claspers, hind-legs and abdomen beneath yellowish.

This is another instance of the larval form mimicking that of a Danais. (See fig. 20, plate VI.)—F. Moore.

Larva. *a*, Full-fed. San Paulo, Feb. 8, 1880.

The caterpillar was found, full-fed, on a prickly climbing plant, on Feb. 8th, 1880.

Pupa. *a*, Feb. 18, 1880.

Pupation takes place in a closely-spun cocoon, into the web of which small particles of the surrounding substances are woven, so as to make the cocoon less conspicuous.

Imago. { *a*, Full-fed, Feb. 8; Imago, March 5, 1880 = 26 days.

The moths appeared March 5th, being in the pupa state about four weeks.

Family Apamiidæ.

* L.—Prodenia Commelinæ.

Phalæna Commelinæ, Smith and Abbott, Lep. Ins. Georgia, ii., p. 189, pl. 95.

Larva.

The caterpillar feeds on cabbage, convolvulus, and some other plants. Specimens found full-fed in middle of January, 1880.

Pupa.

When full-fed the caterpillar enters the ground, and there undergoes pupation.

Imago.

Specimens full-fed 14th January, produced imagos on 3rd and 4th of February.

* With this number (L) was also forwarded—

Prodenia variolosa.

Prodenia variolosa, Walker, Catal. Lep. Het. Brit. Mus. xi., p. 722 (1857).
Prodenia cosmioides, Walker, l. c. xv., p. 1678 (1858).

This is quite a distinct species from *P. commelinæ*.—F. Moore.

Family Calpidæ.

LII.—Gonodonta fulvangula.

Gonodonta fulvangula, Hübner-Geyer, Zutr. Samml. Exot. Schmett. figs. 737–8.

Gonodonta Maria, Guénee, Noct. ii., p. 369.

Larva. *a*, Full-fed. San Paulo, Jan. 22, 1880.

The caterpillar feeds on the Araticu (Rollinia ?), and is at first black. But each change of skin alters its appearance, bright red spots appearing, and the black changing into a beautiful and intricate grey pattern.

Pupa. *a*, February, 1880.

Pupation takes place in a cocoon, which is partly formed of bits of leaf woven into the web, and sticking out in all directions.

Imago. { *a*, Full-fed, Jan. 21; Imago, Feb. 9, '80 = 19 days.
{ *b*,

The moth appears about three weeks after the caterpillar is full-fed.

Family Remigiidæ..

LI.—Remigia mensuralis.

Remigia mensuralis, Walker, Catal. Lep. Het. Brit. Mus. xiv., p. 1499 (1858).

Larva. *a*, Full-fed. San Paulo, Jan. 14, 1880.

These caterpillars appeared in great numbers in January, 1880, in the neighbourhood of San Paulo, feeding on "capim," a sort of coarse grass much grown for feeding horses, etc.

Pupa. *a*, Full-fed, Jan. 14; Imago, Jan. 28, '80 = 14 days.

Pupation takes place in a cocoon spun between the blades of grass.

Imago. *a*, Full-fed, Jan. 14; Imago, Jan. 28, '80 = 14 days.

The moth emerges from the pupa fourteen days after the larva is full-fed.

EXPLANATION OF THE PLATES.

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* Drawn by Mr. J. Chard, Museum Draughtsman, by whom the collection has been mounted for display; all others drawn by Mr. E. Dukinfield Jones.

T. J. M.

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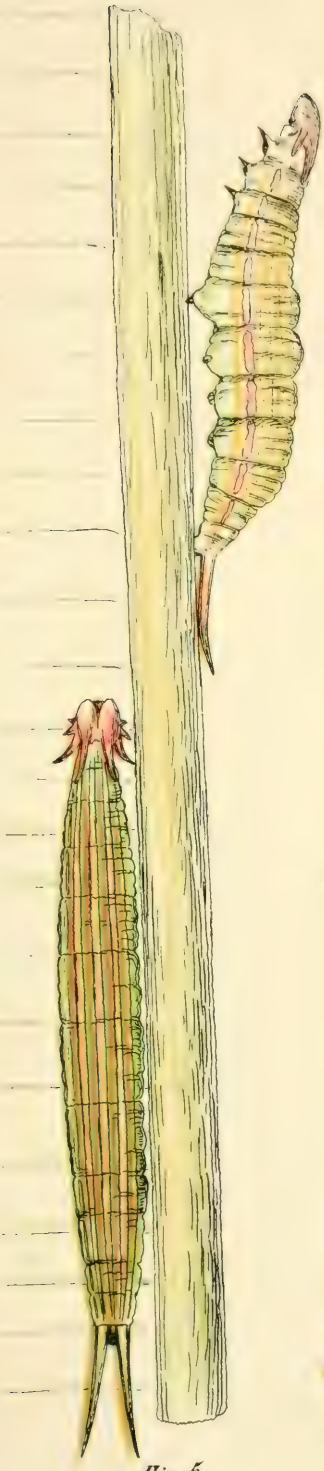


Fig. 5.

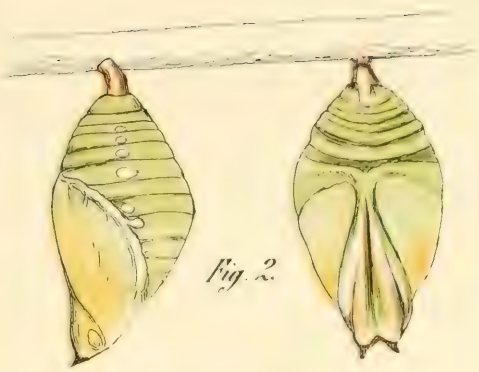


Fig. 2.

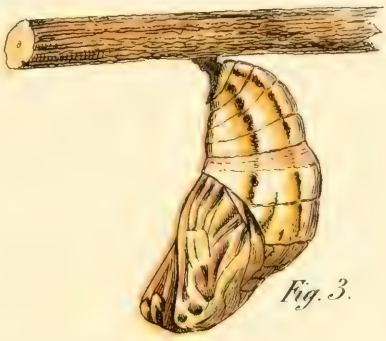
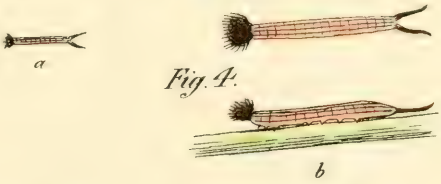


Fig. 3.



a

Fig. 4.

b

Fig. 6.

Fig. 7.

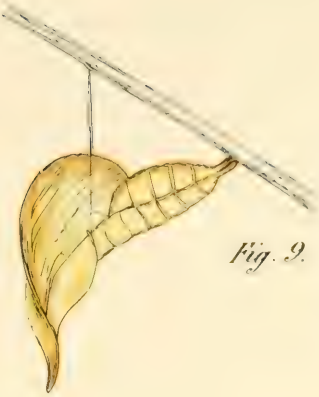


Fig. 9.

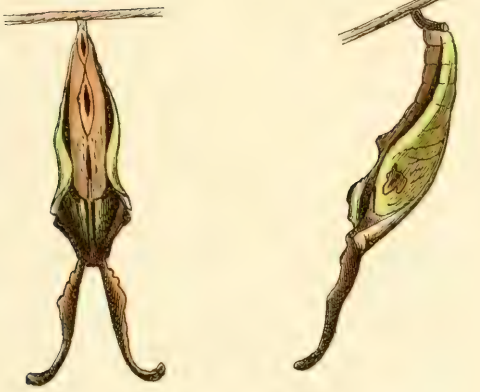


Fig. 8.

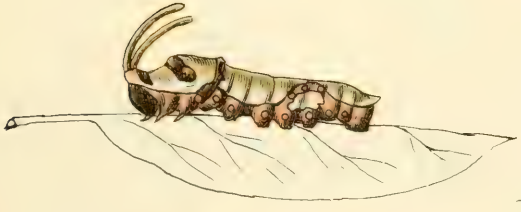


Fig. 10.

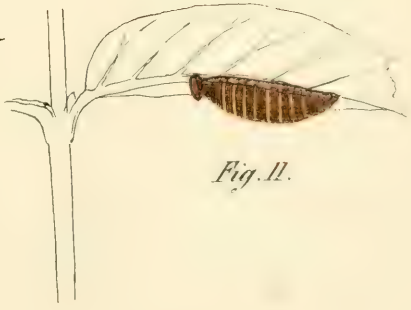


Fig. 11.

Fig. 12.

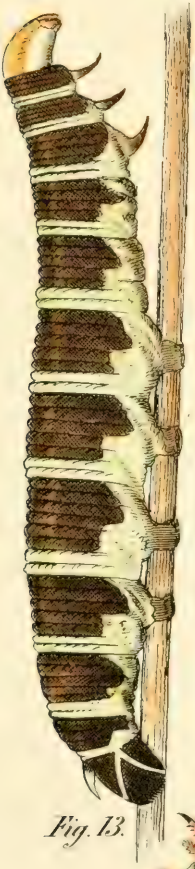


Fig. 13.

Fig. 14.

Fig. 17.

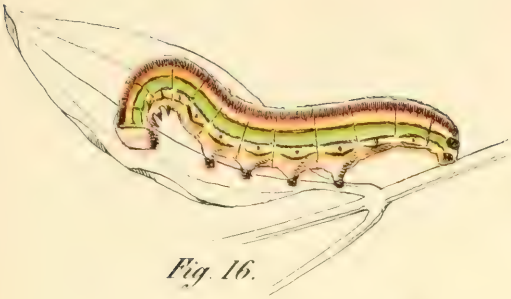


Fig. 16.

Fig. 18.

Fig. 19.

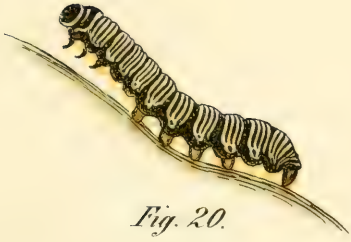


Fig. 20.

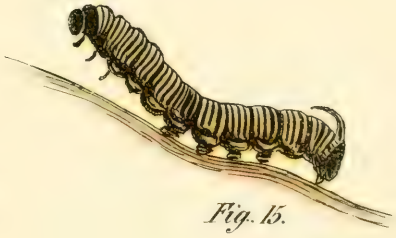


Fig. 15.

Fig. 1.

Fig 1.

Fig 4.

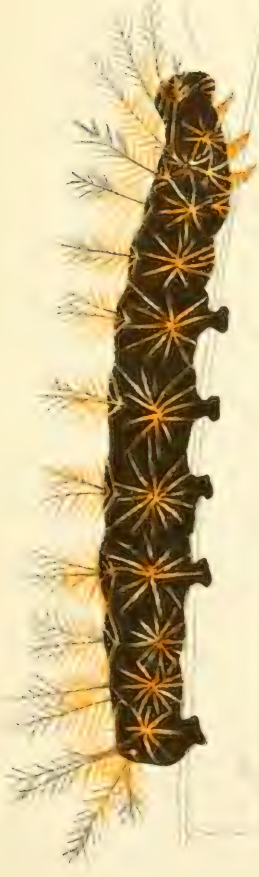


Fig 3.

Fig 2.

E. C. JONES

METAMORPHOSES OF LEPIDOPTERA

FROM SAN PAULO, BRAZIL,

IN THE FREE PUBLIC MUSEUM, LIVERPOOL.

BY

E. DUKINFIELD JONES, C.E.,

CORRESPONDING MEMBER LIT. AND PHIL. SOC., L'POOL.

WITH NOMENCLATURE AND DESCRIPTIONS OF NEW FORMS.

By FREDERIC MOORE, F.Z.S.

SECOND SERIES.

METAMORPHOSES OF LEPIDOPTERA

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Proc. Lit. & Philos. Soc. Liverp., vol.

INTRODUCTORY NOTE.

The following paper, read before the Literary and Philosophical Society of Liverpool, April 30th, 1883,* is a continuation of the one communicated to that Society in November, 1881, and is a description of the metamorphoses of twenty-eight species of Brazilian Lepidoptera, illustrated by specimens, which specimens I have had very great pleasure in presenting to the Liverpool Free Public Museum.

I regret that this series is not so complete as the former one; in many cases the larva or pupa is wanting, either from the fact that I only found one specimen of the larva, and so was not able to preserve the insect in the three stages, or from my having mislaid some of the pupæ on leaving San Paulo. For, unfortunately, I find several pupæ that I thought I had with me are missing. However, on consulting Mr. T. J. Moore, the Curator of the Museum, as to whether I should describe only those species that I have in all three stages, and leave the others until completed at some future date, he replied, "A bird in the hand is worth two in the bush;" and on that principle I have given the descriptions of some species whose life-history I have really worked out, but which are not yet represented in the collection by examples of each state, hoping to have at some future time the good fortune of obtaining specimens to make each species complete.

The critical determination of the species contained in this second collection, as in the first, has, at the recommendation of the Rev. H. H. Higgins, been intrusted by the Library and Museum Committee to Mr. Frederic Moore.

E. D. J.

30*th April*, 1883.

* See the Society's *Proceedings*, Vol. XXXVII, p. lxxvi and pp. 233–259 and Plate.

SYSTEMATIC ARRANGEMENT.

RHOPALOCERA.

Family NYMPHALIDÆ.

Subfam. *Danainæ.*

(Group DANAOID HELICONINA.)

LXX.—Sais Euryanassa.

Subfam. *Acræninæ.*

LXXVI.—Actinote Alalia.

Subfam. *Nymphalinæ.*

LXVI.—Dione Juno.
XLIII.—Dione Vanillæ.
LXXI.—Pyrameis Braziliensis, n. sp.
XXII.—Ageronia ferentina.
VIII.—Heterochroa Syma, var.
XCIV.—Siderone Isidora.

Family PAPILIONIDÆ.

Subfam. *Pierinæ.*

LXXXIV.—Synchloe Monuste.
LXXXVI.—Leptophobia Aripa.

Subfam. *Papilioninæ.*

LXV.—Papilio Bunichus.
LXXVII.—Papilio Polydamas.
LXXXIII.—Papilio Protodamas.

HETEROCERA.

Family SPHINGIDÆ.

XCV.—Philampelus Vitis.
V.—Philampelus Anchemolus.
LXXXV.—Amphonyx Tapayusa, n. sp.

Family ZYGÆNIDÆ.

XIV.—Saurita Cassandra.

Family NOTODONTIDÆ.

XCIII.—Aneurocampa Mingens.

Family PSYCHIDÆ.

LVIII.—Genus ———?

Family SATURNIIDÆ.

XXVI.—Automeris illustris.
XVIII.—Automeris ophthalmica, n. sp.
C.—Attacus Arethusia.
XLVII.—Attacus Jacobææ.

Family LASIOCAMPIDÆ.

XLIV.—Syssisphinx Molina.
XC.—Mesotages trilunula.
XXXIX.—Megalopyge fuliginosa, n. sp.
LXIV.—Hyleria falcifera.

Family TINEIDÆ.

XCVII.—Endrosis Braziliensis, n. sp.

The above arrangement includes only those species which are enumerated in this paper. In the following page they are incorporated with the species contained in the previous collection, as given in the Proceedings of the Society for 1881–2, p. 331.

F. MOORE.

COMBINED SYSTEMATIC ARRANGEMENT

OF

MR. DUKINFIELD JONES' FIRST AND SECOND COLLECTIONS

OF

BRAZILIAN LEPIDOPTERA.

RHOPALOCERA.

Family NYMPHALIDÆ.

Subfam. *Danainæ*.

LXII.—Danais Erippus.

(Group DANAOID HELICONINA).

LXX.—Sais Euryanassa.
XXV.—Mechanitis Lysimnia.

Subfam. *Morphinæ*.

XLI.—Morpho Hercules.
III.— ,, Epistrophis.

Subfam. *Brassolinæ*.

XXXIV.—Brassolis Astyra.
XIX.—Opsiphanes Glycerie.

Subfam. *Acræinæ*.

XV.—Acræa Pellenea.
LXXVI.—Actinote Alalia.
LXXXII.—Actinote Alalia, var.

Subfam. *Heliconiinæ*.

LXIX.—Eueides Dianasa.

Subfam. *Nymphalinæ*.

LXVI.—Dione Juno.
XLIII.— ,, Vanillæ.
LXXI.—Pyrameis Braziliensis.
LIII.—Junonia Cænia.
VII.—Ageronia Amphinome.
XXII.— ,, ferentina.
VIII.—Heterochroa Syma.
XCIV.—Siderone Isidora.

Family PAPILIONIDÆ.

Subfam. *Pierinæ*.

XXIV.—Catopsilia Philea.
LXXXIV.—Synchloe Monuste.
LXXXVI.—Leptophobia Aripa.

Subfam. *Papilionæ*.

XXXI.—Papilio Thoas.
XLV.— ,, Grayi.
XXXVIII.—Papilio Evander.
XLII.— ,, Lysithous.
LXV.— ,, Bunichus.
LXXVII. ,, Polydamas.
LXXXIII. ,, Protodamas.

Family HESPERIIDÆ.

XXI.—Pyrrhopyga Palemon.
LIV.—Goniuris Proteus.

HETEROCERA.

Family SPHINGIDÆ.

XCV.—Philampelus Vitis.
V. ,, Anchemolus.
LV.—Dilophonota Ello.
LXI.—Argeus Labruscæ.
LXXXV.—Amphonyx Tapayusa.
XXVIII.—Pachylia inornata.
XIII.—Sorocaba anomala.

Family ZYGÆNIDÆ.

XIV.—Saurita Cassandra.

Family CHALCOSIIDÆ.

LXXII.—Phæochlæna tendinosa.

Family ARCTIIDÆ.

XXX.—Daritis sacrifica.
XLVI.—Motada lateralis.

Family PSYCHIDÆ.

LVIII.—Genus ?
XXXIII.—Perophora albistriga.
IX.— ,, externa.

Family Notodontidæ.

XXIX.—Aneurocampa lateralis.
XCIII.— ,, Mingens.

Family Saturniidæ.

I.—Automeris sp.?
II.— ,, Metea.
XXVI.— ,, illustris.
XVIII.— ,, ophthalmica.
XX.—Molippa Sabina.
LXXV.—Arsenura erythrinæ.
LX.—Attacus Aurota.
C.— ,, Arethusia.
XLVII.—Attacus Jacobææ.

Family Limacodidæ.

LXVII.—Pinconia ochracea.
LXXX.—Neomiressa argentata.
LXXIX.—Narosa rufotessellata.

Family Lasiocampidæ.

IV.—Eacles Laocoon.
XLIV.—Syssisphinx Molina.
XVII.—Megalopyge Citri.

Family Lasiocampidæ—*continued.*

XXXV.—Megalopyge dorsimacula.
LXXXI.— ,, sp.?
XL.— ,, Tharops.
XXXIX.— ,, fuliginosa.
XC.—Mesotages trilunula.
LXIV.—Hyleria falcifera.
XXVII.—Hydrias Deusta.

Family Glottulidæ.

LVII.—Cabralia trifasciata.

Family Apamiidæ.

L.—Prodenia Commelinæ.
,, variolosa.

Family Calpidæ.

LII.—Gonodonta fulvangula.

Family Remigiidæ.

LI.—Remigia mensuralis.

Family Tineidæ.

XCVII.—Endrosis Braziliensis.

F. MOORE.

METAMORPHOSES OF BRAZILIAN LEPIDOPTERA.

RHOPALOCERA.

Family Nymphalidæ.

Subfam. *Danainæ*.

Group Danaoid Heliconina.

Genus Sais. Hübner.

LXX.—Sais Euryanassa.

Ithomia Euryanassa, Felder, Wien. Ent. Monats. iv., p. 101 (1860) : Reise, Novara, Lep. 11., pl. 44., f. 1.

Larva. Full-fed. San Paulo, 16th June, 1881.

The caterpillars of this species are found in great quantities on the leaves of a species of Datura, the eggs being deposited in clusters of about two hundred on the underside of the leaves. The caterpillar is quite smooth, with a velvety black skin and a red head.

Pupa. { Full-fed, 16th June, 1881. / Imago, 6th July, 1881. } 20 days.

When full-fed the caterpillar becomes suffused with a greenish tint, and hangs itself up by the tail to undergo pupation. The chrysalis is a very compact and neat one. It is of a semi-transparent brown colour, thickly dotted with black.

Imago. { Full-fed, 16th June, 1881. / Imago, 6th July, 1881. } 20 days.

The very delicate and beautiful butterfly appears three

weeks after pupation. It is a common fly in San Paulo, and is often seen in the streets of the town, where it has probably been reared in some garden at the backs of the houses. There are several broods in the year.

Subfam. *Acræinæ*.

Genus Actinote. Hübner.

LXXVI.—Actinote Alalia.

Acræa Alalia, Felder, Wien. Ent. Monat. iv., p. 105 (1860).

Larva. Full-fed, San Paulo, 28th October, 1881.

The caterpillar feeds upon a shrub, the name of which I do not know. I have taken it in the forest on the Serra da Cantareira, near San Paulo. It is of a pale bluish colour, and is thickly covered with spines, which apparently have no venomous properties.

Pupa. Not preserved.

The caterpillar hangs itself up by the tail to undergo pupation. The chrysalis is of a creamy white colour, ornamented with black veins and a double row of black spines on the back.

Imago.

a, ♂	Full-fed, 28th Oct., 1881.	19 days.
	Imago, 16th Nov., 1881.	
b, ♀	Full-fed, 28th Oct., 1881.	19 days.
	Imago, 16th Nov., 1881.	

The butterfly emerges in a little under three weeks from the time of pupation.

[Note.—A variety of this species, reared by Mr. Dukinfield Jones, is described in the former paper, published in the Proc. of the Lit. and Phil. Soc. of Liverpool, 1881–2, p. 340, No. LXXXII, and in Museum Report No. 2, p. 36.]

Subfam. *Nymphalinæ.*

Genus DIONE. Hübner.

Syn. *Agraulis.* Boisd., Doubleday.

LXVI.—DIONE JUNO.

Papilio Juno, Cramer, Pap. Exot. 111., pl. 215, f. B.C. (1782).

LARVA. Full-fed, San Paulo, 21st April, 1880.

The caterpillar feeds on a species of Passion-flower, and is often found in company with No. XLIII, *Dione Vanillæ,* var. It is more social in its habits than the latter species, and may be taken in clusters of a dozen or so on a single leaf. It is of a dark brown colour, and is covered with spines.

PUPA. { Full-fed, 21st April, 1880. / Imago, 12th May, 1880. } 21 days.

When about to undergo pupation the caterpillar attaches itself by the tail to the stalk of the food-plant, the coping of a wall, or other convenient spot.

IMAGO. { Full-fed, 21st April, 1880. / Imago, 12th May, 1880. } 21 days.

The butterfly emerges three weeks after pupation.

XLIII.—DIONE VANILLÆ (variety).

Papilio Vanillæ, Linn. Syst. Nat. i., 2, p. 787 (1767). Cramer, Pap. Exot. iii., pl. 212, fig. A.B.

LARVA. Full-fed, San Paulo, 14th April, 1880.

The caterpillar of this insect feeds upon the leaves of a Passion-flower that is common in the neighbourhood of San Paulo. It is of a pale brown colour, with dark longitudinal stripes down the back, and is covered with horny spines.

Pupa. Full-fed, 14th April, 1880.

When full-fed the caterpillar wanders away from the food-plant, and seeks a convenient spot, such as the coping of a wall or other protected situation, where it suspends itself by the tail and undergoes pupation.

Imago. { *a*, Upper side, Full-fed, 15th Ap., 1880. / Imago, 2nd May, 1880. } 17 days.
{ *b*, Under side, Full-fed, 14th Ap., 1880. / Imago, 30th April, 1880. } 16 days.

This beautiful butterfly is very common ; in fact, it is one of the commonest about San Paulo. It emerges from the chrysalis sixteen days after the caterpillar is full-fed.

Genus Pyrameis. Hübner.

LXXI.—Pyrameis Braziliensis, n. sp.

Pyrameis Braziliensis, n. sp. :—Forewing with the basal area golden-brown, from thence to the apex purplish-black; obliquely across the disc is a series of bright red spots, two of which are in the middle of the cell, and form an irregular-shaped letter S, the ends of which are very broad, and the outer end tipped with white at its external angle; two small conjoined spots are beyond lower end of the cell, followed by a quadrate spot centred with a white dot; below these is a larger oblique quadrate spot, followed by a small spot near the posterior angle ; beyond the end of the cell is a transverse white streak crossed by black veins, and near the apex is a transverse series of four small spots, the upper and lower of which are white, the two middle ones being minute and bluish-white ; beyond these is a submarginal lunular line, the upper end of which is purplish-white and the lower end pale brown. Hindwing with a purplish-black basal mark, a discal centrally-angled band and a distinct submarginal lunular band, these bands enclosing two ocellated spots and an intermediate black dot; along the extreme outer margin is a row of black angular spots. Cilia alternated with white. Body golden-brown. Expanse 2 to $2\frac{1}{4}$ inches.

[Note.—*Pyrameis Myrinna*, a very distinct species from the above, was also collected by Mr. Dukinfield Jones in the same locality as *P. Braziliensis*, but its metamorphoses not having been worked out, the specimens remain in his private collection.—F. Moore.]

LARVA. Not preserved.

a, *b*. Nests made by larva amongst flowers of food-plant.

The caterpillar is of a silvery grey colour, with bands of dark brown round the segments, which are covered with long spines. The food-plant is a kind of "everlasting flower," called by the Brazilians "Marcello," the flowers of which are dried and used for stuffing pillows. The caterpillars are solitary, only one or two being found on the same plant; and in the earlier stages they make a sort of nest amongst the flowers, into which they retire when not feeding.

PUPA. { Full-fed, 20th April, 1880. / Imago, 24th May, ,, } 34 days.

When full-fed the caterpillar suspends itself by the tail, and in that position changes to the pupa state.

IMAGO. { *a*, Upper side. Full-fed, 20th Ap., 1880. / Imago, 24th May, ,, } 34 days.

b, Under side.

The butterfly appears five weeks after the larva is full-fed. In its habits it somewhat resembles Junonia, delighting in sunning itself on bare patches of ground in the Campos.

Genus AGERONIA. Hübner.

XXII.—AGERONIA FERENTINA.

Nymphalis ferentina, Godart, Enc. Meth. ix., p. 428 (1823).

LARVA. *a*, Full-fed. San Paulo, March, 1878.

The caterpillar feeds on the same plant, or closely allied species, as No. VII (*Ageronia Amphinome*). It is of a grey colour, and is covered with horny spines, with two large horns on the head. It is smaller than *A. Amphinome*, and has not the same restless habits.

Pupa. { *a*, Full-fed, 6th March, 1878. / Imago, 16th ,, ,, } 10 days.

When full-fed the caterpillar hangs itself up by the tail to undergo pupation, the pupa state lasting ten days.

Imago. { *a*, Full-fed, 6th March, 1878. / Imago, 16th ,, ,, } 10 days.

The butterfly is common in the neighbourhood of San Paulo. In its habits it closely resembles *A. Amphinome*, settling on the trunks of trees with the head downwards and the wings spread out against the bark. From its resting-place it every now and then takes short flights after passing friends, circling round and making a noise like a series of electric sparks.

Genus Heterochroa. Boisd.

VIII.—Heterochroa Syma (variety).

Nymphalis Syma, Godart, Enc. Meth. ix., p. 374 (1823). Hübner, Zutr. Exot. Schmett, fig. 571–2.

Larva. *a*, Full-fed, San Paulo, 1882.

The caterpillar feeds on a species of bramble, and is of a dark green colour, covered with protuberances with spines at the ends. When not eating, it rests with the thorax raised and the head bent down, giving it a very grotesque appearance. When full-fed the colour changes to a dull yellowish brown.

Pupa. { *a*, Empty shells, Full-fed, 21st Feb., 1878. / Imago, 6th March, ,, } 13 days. / *b*, In spirit, Full-fed, 8th April, 1878.

The caterpillar hangs itself up by the tail on the underside of a leaf or other suitable spot, to undergo pupation. The pupa condition lasts about a fortnight.

Imago. { *a*, Upper side. / *b*, Under side, Full-fed, 2nd Dec., 1881. / Imago, 14th Dec., ,, } 12 days.

This butterfly is very common in the neighbourhood of San Paulo, especially at the edges of swamps and similar situations. Its flight is like that of the *Vanessidæ*, a few sharp vigorous strokes, and then a gliding motion, with the wings almost horizontal. There appear to be many broods of this species in the year, as I have found the full-fed caterpillar in February, April, October, and December.

Genus Siderone. Hübner.

XCIV.—Siderone Isidora.

Papilio Isidora, Cramer, Pap. Exot. iii., pl. 235, fig. A. B. E. F. (1782).

Larva. Not preserved.

I took only one specimen of this caterpillar full-fed on 23rd December, 1881. It had already left its food-plant, and was searching for a suitable place for pupation. The caterpillar is smoke colour, and has two fleshy protuberances on the thorax and a pair of horns on the head.

Pupa. { Full-fed, 23rd Dec., 1881. / Imago, 7th Jan., 1882. } 15 days.

On December 24th the caterpillar suspended itself by the tail, and pupation took place on the 26th.

Imago. { Full-fed, 23rd Dec., 1881. / Imago, 7th Jan., 1882. } 15 days.

The curious butterfly appeared a fortnight after the caterpillar was full-fed. When at rest it closes the wings together, and stands head downwards on the trunk of a tree,

in which position it has a remarkable resemblance to a dry leaf.

Family Papilionidæ.

Subfam. *Pierinæ*.

Genus Synchloe. Hübner.

LXXXIV.—Synchloe Monuste.

Papilio Monuste, Linn. Syst. Nat. i. 2, p. 760 (1767). Cramer, Pap. Exot. ii., pl. 141, fig. f.

Ova. On Nasturtium leaf, San Paulo, March, 1881.

The eggs are laid in clusters of about fifty, on the upper side of the leaf of the food-plant. Time of incubation not determined.

Larva.

Hatched,	21st	March,	1881.
Changed skin,	25th	,,	,,
,,	27th	,,	,,
,,	29th	,,	,,
,,	1st	April,	,,
Full-fed,	6th	,,	,,

The caterpillar feeds on Nasturtium, and is of a pale-green colour, covered with minute purple tubercles.

Pupa. { Full-fed, 6th April, 1881. / Imago, 20th ,, ,, } 14 days.

The caterpillar attaches itself by the tail, and a loop round the thorax, to a wall, paling, &c., to undergo pupation.

Imago. { Full-fed, 6th April. / Imago, 20th ,, } 14 days.

The butterfly appears a fortnight after the caterpillar is full-fed.

Genus Leptophobia. Butler.

LXXXVI.—Leptophobia Aripa.

Pieris Aripa, Boisd. Spec. Gén. Lep. i., p. 528 (1836).

Larva. Full-fed. San Paulo, 26th March, 1881.

The caterpillar is green, and feeds on Nasturtium. I took it full-fed at the end of March, 1881.

Pupa. Not preserved.

The caterpillar fixes itself by the tail, and a loop round the thorax, for pupation.

Imago. { Full-fed, 26th March, 1881. / Imago, 6th April ,, } 11 days.

The dormant period is remarkably short in this species, the butterfly appearing eleven days after the caterpillar is full-fed.

Subfam. *Papilioninæ*.

Genus Papilio. Linn.

LXV.—Papilio Bunichus.

Menelaides Bunichus, Hübner, Samml. Exot. Schmett.
Papilio Bunichus, Boisd. Spec. Gén. Lep. i., p. 308.

Larva. Full-fed. San Paulo, 4th Dec., 1877.

This caterpillar feeds upon a species of Aristolochia. It is covered with soft fleshy protuberances, and has a V-shaped scent organ on the first segment, which is protruded when annoyed. The colour is almost black, with a reddish tinge, and there is a creamy-white diagonal stripe, beginning on the sixth and ending on the protuberance on the seventh segment.

Pupa. { Full-fed, 10th March, 1880. / Imago 30th ,, ,, } 20 days.

When full-fed the caterpillar attaches itself by the tail

and a thread round the thorax, to the underside of a branch of a tree or the coping of a wall, or other similar situation, and in that position undergoes pupation.

Imago. { *a*, ♂ / *b*, ♀ Full-fed, 10th March, 1880. / Imago 30th „ „ } 20 days.

The butterfly emerges three weeks after pupation. It is a very common species, and there are several broods in the year, fresh specimens having been taken in the spring (August and September), being one of the earliest of the larger butterflies that appears after the cold season, and also in December, and again in March and April.

LXXVII.—Papilio Polydamas.

Papilio Polydamas, Linn. Syst. Nat. i. 2, p. 747 (1767). Drury, Exot. Ent. i., pl. 17, fig. 1, 2.

Larva. Full-fed. San Paulo, Oct., 1881.

This caterpillar feeds upon a species of Aristolochia that is a rare plant in the neighbourhood of San Paulo, and consequently the caterpillar is rare also. It is of a smoky brown colour, marked with numerous diagonal dark stripes, and is covered with short and slender fleshy protuberances. On the first and tenth segments the lateral protuberances are movable, and the caterpillar twitches them up and down in an odd way as it walks. There is a V-shaped scent organ on the pro-thoracic segment that is exserted when the insect is annoyed.

Pupa. { *a*, Full-fed, 28th Oct., 1881. / Imago, 24th Nov., „ } 27 days. / *b*, Ichneumonised specimen.

The caterpillar attaches itself by the tail and a loop

round the thorax to the trunk of a tree or the coping of a wall, &c., for pupation.

IMAGO. { Full-fed, 28th Oct., 1881. / Imago, 24th Nov., ,, } 27 days.

The butterfly appears about four weeks after pupation. Though the caterpillar is difficult to obtain, owing to the rarity of the food-plant, the butterfly is by no means rare. It is, in fact, very plentiful at certain seasons of the year.

LXXXIII.—PAPILIO PROTODAMAS.

Papilio Protodamas, Boisd. Spec. Gen. Lep., p. 322 (1836).

LARVA. Not preserved.

I took this caterpillar in the forest on the Serra da Cantareira in January, 1882. It very closely resembles No. LXXVII, but is of a paler colour. It feeds upon a species of Aristolochia (not the same as the food-plant of No. LXXVII).

PUPA. { Full-fed, 22nd January, 1882. / Imago, 15th February, ,, } 24 days.

The caterpillar attaches itself by the tail and a loop round the thorax to the surface selected by it on which to undergo pupation.

IMAGO. { Full-fed, 22nd January, 1882. / Imago, 15th February, ,, } 24 days.

This butterfly seems to be a forest species, and is rarely met with in the open plain, where its close ally (No. LXXVII) *Papilio Polydamas* delights to sport.

HETEROCERA.

Family Sphingidæ.

Genus Philampelus. Harris.

XCV.—Philampelus Vitis.

Sphinx vitis, Linn. Mus. Ulr., p. 354 (1764).

Sphinx fasciatus, Sulzer, Gesch. Ins., pl. 20, fig. 1 (1776).

Larva. { *a*, Penultimate stage.
{ *b*, Last stage, not full-fed.

The caterpillar feeds upon a species of *Jussiæa* that grows in marshes and at the sides of streams. It has a large yellow flower, something like an evening primrose. In its earlier stages the caterpillar is green, with the characteristic diagonal markings of the Sphingidæ; but after the last change of skin the colouring undergoes a remarkable change, the markings being very intricate and the general colour a rich madder brown. It is very subject to attacks of an ichneumon. Out of some twenty specimens I only succeeded in rearing three moths, the rest being all ichneumonized.

Pupa. Not preserved.

The caterpillar enters the ground to undergo pupation.

Imago. { Full-fed, San Paulo, 7th Jan., 1882.
{ Imago, 6th Feb., ,, } 30 days.

The moth appears a month after the caterpillar enters the ground.

V.—Philampelus Anchemolus.

Sphinx Anchemolus, Cramer, Pap. Exot. iii., pl. 224, fig. c. (1782).

Larva. Not preserved.

The caterpillar of this species feeds on the grape-vine. I

only took one specimen of the larva, and having worked it through to the perfect insect, am unable to place it in the collection. This specimen I took near San Paulo, on 21st December, 1877. It was five inches in length, and about three-quarters of an inch thick. There was no horn on the last segment, only a slight hump. The colour is green, thickly peppered over with very minute black dots.

Pupa. { Full-fed, 23rd December, 1877. / Imago, 5th February, 1878. } 44 days.

When full-fed the caterpillar changes to a smoky brown colour, and enters the ground for pupation.

Imago. { ♂ Full-fed, 23rd December, 1877. / Imago, 5th February, 1878. } 44 days.

The magnificent moth appeared about six weeks after the caterpillar was full-fed.

Genus Amphonyx. Poey.

LXXXV.—Amphonyx Tapayusa, n. sp.

Amphonyx Tapayusa, n. sp. Forewing hoary, rusty tinted; with a whitish basal spot, two sub-basal transverse zigzag slender white bands, the interspace between which is numerously black-scaled, two medial transverse inwardly oblique zigzag black bands, and four discal similar bands; from the outer discal band, near its upper end, is a black zigzag line curving to the apex; a black streak also extends from the inner middle band between the two upper median veins to the outer discal band; the interspaces between the submedian and lower median veins to the outer discal black band, and between the two discal bands to the costal end, as well as broadly along the upper median vein, are of a paler rusty colour; the remaining interspace between the two lower medians and the upper median and subcostal is greyish; the outer border of the wing is also indistinctly traversed by whitish zigzag marks, and there is a distinct white spot at end of the cell. Hindwing with a large basal orange-yellow spot and broad black costal and marginal band, the discal area being semitransparent and traversed by black veins. Body, hoary; tegulæ bordered by black; abdomen with a lateral black line and four upper lateral spots, the anterior spot being white and the others yellow. Expanse 6¼ inches. Allied to *A. Duponchellii*.—F. Moore.

Larva. Full-fed, San Paulo, Feb., 1881.

The caterpillar of this magnificent species feeds on the Araticú (Rollinia?), and is by no means uncommon from February to May. It is of a bright green colour. There is a purplish horn, with a rough warty surface, on the eleventh segment, and a white diagonal stripe runs from the base of the horn to the ninth segment. When full-fed the colour becomes somewhat paler and duller. When annoyed this caterpillar has a habit of flinging its head round and striking the offending object. It also often bends itself backwards into a horse-shoe, holding on to the twig by its anal and last pair of abdominal legs. It prefers the leaves at the ends of the twigs for food, and hides amongst the untouched leaves lower down, where it is not easily detected, owing to its green colour. I have generally found it by observing the bare twigs and searching amongst the leaves. (See Plate VII, fig. 1.)

Pupa. Full-fed, April, 1882.

When full-fed the caterpillar enters the ground for pupation.

Imago. { Full-fed, 13th Feb., 1881. / Imago, 7th April, 1881. } 54 days.

The moth emerges about two months after the caterpillar enters the ground.

Family Zygænidæ.

Genus Saurita. Boisd.

XIV.—Saurita Cassandra.

Sphinx Cassandra, Linn. Syst. Nat. ii., p. 806 (1767).

Larva. Not preserved.

I found only one specimen of this caterpillar in the woods

near San Paulo, in the middle of March, 1878. It is short and stumpy, and is thickly covered with velvety hairs that give it a beautiful glossy appearance.

Pupa. { *a*, Full-fed, 14th March, 1878. / Imago, 30th March, 1878. } 16 days.

On March 14th, the caterpillar began to spin, or rather to build, its very beautiful cocoon, which it did in a very remarkable manner. Choosing a spot on the wall of my room, it began by plucking itself and laying the hairs round it in an oval shape, attaching them to the wall with gum. Then another layer was laid on the first, and so on, building up the cocoon in the most workmanlike way. It was a wonderful sight to watch the little creature lay the hairs down so symmetrically, first on one side and then on the other, building a house out of its cast-off clothes. The hairs are very beautiful under the microscope, being barbed all the way up, the barbs being so long and fine as to give the appearance of feathers.

Imago. { *a*, Full-fed, 14th March, 1878. / Imago, 30th March, 1878. } 16 days.

The moth emerged on March 30th. It is a beautiful insect, the wings being black and the body glistening with scarlet and blue.

Family Notodontidæ.

Genus Aneurocampa. Boisd.

XCIII.—Aneurocampa Mingens.

Aneurocampa Mingens, Boisd. H.Sch. Lep. Exot., pl. 18, f. 83.

Larva. Full-fed. 22nd April, 1881.

This remarkable caterpillar feeds upon a species of Melastoma. I have taken it full-fed in December and in April.

The colour is bright green. A white line passes down each side, above the stigmata, from the fourth to the tenth segment, and there is a crimson band, bordered on the front with pale blue, across the thorax. The eleventh segment is ornamented with bright yellow swellings, which the caterpillar has the power of puffing out and making very conspicuous. This brilliant colouring is a good illustration, as pointed out to me by Professor Herdman, of the theory that it is really a protection to the caterpillar to be conspicuous; for this caterpillar possesses the remarkable power of ejecting from its mouth a fine jet of acid fluid upon any enemy that attacks it. This fluid has a very pungent smell, and, I should imagine, would be quite sufficient to make any bird drop the caterpillar. And, no doubt, in time the birds would learn not to attack so objectionable a mouthful, and so the caterpillar would not run the risk of being damaged by their beaks. The amount of fluid discharged is equal to a good-sized drop, and it can be repeated several times, though it takes a good deal of irritation to cause a second or third discharge. The precision with which the jet is directed upon the offending object is remarkable. I have tested the acidity of the fluid with blue litmus, which was immediately reddened. (See Plate VII, fig. 2.)

Pupa.	Full-fed, 22nd April, 1881. Imago, 2nd Nov. ,,	194 days.

When full-fed, the caterpillar spins a gummy cocoon on the surface of the ground, and attaches to the cocoon leaves, bits of earth, etc. On breaking open a cocoon in August, I found the insect still in the larval condition. Pupation took place in September, five months after the caterpillar was full-fed.

Imago.	Full-fed, 22nd April, 1881. Imago, 2nd Nov., ,,	194 days.

The moth appeared at the beginning of November, more than six months after the caterpillar was full-fed.

Family Psychidæ.

LVIII.—Genus ———— ?

Larva. { *a*, Full-fed, San Paulo, 1882.
b, Larva cases.
c, Web spun by larva when walking over a smooth surface.

This remarkable caterpillar makes a tapering, conical, almost cylindrical case, in which it spends its life, never under any circumstances leaving this case. It feeds on a variety of plants, and I have found it in great numbers on a species of Mimosa. The case is quite smooth, and without any sticks or bits of leaf, which are employed by most species of this group which have come under my notice.

The caterpillar often lets itself down by a thread when it wants to move to new feeding-ground. The feeding of all the species of this group that I have observed, appears to be very irregular and intermittent. The caterpillars will sometimes secure themselves temporarily by binding the mouth of the case to a twig or a leaf, and remain for several days, or even weeks, without eating; then they unfasten themselves, and move about and eat. They are full-fed about December, I fancy; but the exact date is very difficult to ascertain, owing to the above habit of intermittent feeding. The appearance of the caterpillar when walking with the case hanging down from the leaf, and the way in which he suddenly draws the case over his head, and shuts tight the baggy mouth, when disturbed, are very comical.

Pupa. Pupation takes place within the case.

IMAGO. { ♂ Not preserved.
♀ Preserved in spirit, March, 1880.

The female moth is wingless, legless, and mouthless, and is, in fact, almost nothing more than a living bag of eggs. The male is of a dull brown colour, with a long abdomen, and the wings are narrow and long, and almost devoid of scales at the tips. Unfortunately, I am not quite certain as to the identity of the specimens I have, two species having been mixed together; so I delay placing the male in the collection until some future date, when I hope to procure males of whose identity there can be no doubt.

The female does not leave the case when she emerges from the pupa, but is fertilised, and lays her eggs in the empty pupa-shell, and for some time after laying the eggs she still remains in the case. On March 13th, 1880, I found several specimens that had left their cases, that were hanging up in my room. They had laid all their eggs, and were mere bags distended with air, and they rolled about on the table in a helpless way, reminding me forcibly of maggots. The skin was blown quite tight, like a bladder, and the tracheæ could be traced beautifully through the thin integument. To see whether there was anything but air inside the animal, I placed one of them under bisulphide of carbon fumes for a minute or two, and when dead, as I thought, I punctured the abdomen. A slight pressure forced the air out of the insect, and it became a wretched shrivelled-up bit of skin. I then introduced a pipette, and blew the skin out again. But, to my astonishment, after all this, the effects of the bisulphide passed off, and the moth revived, apparently none the worse for the operation.

On cutting open one of the cases that the moths had left, I found the pupa-shell full of already hatched larva. The effect was most wonderful. I slit the pupa-case open a little, and the tiny caterpillars came pouring out in myriads. In

another case I cut open, I found the female moth still inside alive, below the pupa skin, which was full of young caterpillars, and she was distended with air, as the other specimens.

Family Saturniidæ.

Genus Automeris. Hübner.

XXVI.—Automeris illustris.

Hyperchiria illustris, Walker, Catal. Lep. Het. Brit. Mus., vi., p. 1285 (1855).

Larva. Not preserved.

This caterpillar is a very beautiful one. It is about three and a half inches in length when full-fed, and is bright green in colour. It is covered with long tree-like tufts of yellowish green spines, which are very venomous, and has a small light blue spot at the stigmata.

Pupa. { *a*, Full-fed, San Paulo, 20th Feb., 1878. / Imago, 7th June, ,, } 107 days.

This caterpillar changes to the pupa condition within a slight cocoon spun amongst leaves.

Imago. { *a*, ♂ Full-fed, 20th Feb., 1878. / Imago, 7th June, ,, / *b*, ♀ } 107 days.

The moth emerged at the beginning of June.

XVIII.—Automeris ophthalmica, n. sp.

Automeris ophthalmica, n. sp.—Female. Dull cinnamon-red; forewing with an antemedial transverse indistinct narrow black zigzag line, and a distinct black oblique postmedial nearly straight line terminating at the apex; at the end of the cell is a large irregular angulated black-bordered mark; crossing the upper part of the disc is an indistinct darker red fascia,

and there is a very indistinct pale zigzag line traversing the submargin. Hindwing brighter coloured, the outer border and cilia being pale cinnamon-yellow; on the centre of the wing is a very large black ocellus, with a narrow pale yellow outer border, and a yellow-margined broad curved brown central spot, traversed by a slender white angular line; beyond the ocellus is a narrow black discal wavy line. Sides of thorax bordered with yellow. Expanse 4½ inches.—F. Moore.

Larva. Not preserved.

I found only one specimen of this caterpillar, feeding on a species of Iris, near San Paulo, at the beginning of December, 1877. When full-fed it was three inches and a half in length. The body is of a deep black colour, and is covered with long tufts of venomous spines, which are of a rich chestnut colour near the body, and black at the tips. When irritated, the caterpillar made a curious clicking sound, apparently with the mandibles. (See Plate VII, fig. 3).

Pupa. { *a*, Full-fed, 18th Dec., 1877. / Imago, 16th April, 1878. } 119 days.

The caterpillar began to spin on December 18th. The cocoon is slight, and is spun between the leaves of the food-plant. While in the pupa state the insect from time to time gave a series of violent shakes and twistings within the cocoon.

Imago. { *a*, ♀ Full-fed, 18th Dec., 1877. / Imago, 16th April, 1878. } 119 days.

The beautiful moth emerged on April 16th.

Genus Attacus. Linn.

C.—Attacus Arethusia.

Attacus Arethusia, Walker, Catal. Lep. Het. Brit. Mus., v., p. 1204 (1855).

Larva. { Taken from newly-spun cocoon, Theresopolis, Organ-Mountains, 16th Nov., 1882.

The caterpillar apparently feeds upon a tree called by the Brazilians, Herva de lagarto, for I found great numbers of cocoons surrounding a tree of this species. But, unfortunately, I did not find a single caterpillar that had not begun to spin, and therefore am not certain of the food-plant.

PUPA. { Full-fed, Theresopolis, (about) 16th Nov., 1882.
Imago, on my return to Liverpool, Feb. to April, 1883.

The cocoons were spun on twigs of the low shrubs about the tree on which, I imagine, the caterpillars feed. The silk was spun a good way down the twig, to strengthen it in case of accident.

IMAGO. { *a*, ♂ Full-fed, 16th Nov., 1882.
Imago, Feb., 1883.
b, ♀ Full-fed, 16th Nov., 1882.
Imago, Feb., 1883.

The moths began to appear in January, but the greater part of them emerged in February, and five out of about twenty pupæ delayed their exit until the middle of April, one not having yet made its appearance in the perfect state. Many of the moths were deformed, owing probably to their being shaken and disturbed by their journey while pupating. Several of the moths had got turned end for end in the cocoons, and were unable to make their exit. This was also, most likely, owing to the fact of the cocoons being shaken about while the insect was still in the larval condition, and, perhaps, in an inverted position when pupation took place; for, of course, the pupa itself could not possibly reverse its position in the cocoon.

LXVII.—Attacus Jacobææ.

Attacus Jacobææ, Walker, Catal. Lep. Het. Brit. Mus. v., p. 1211 (1855).

Ova.

The eggs are laid in rows, and there are from six to nine in a cluster. I have not determined the time of incubation.

Larva. Not preserved.

The caterpillar feeds upon several different plants, and I have taken it full-fed in October and February. In the earlier stages it is of a yellowish colour, and the spines black. When full-fed it is bright green, with a white diagonal stripe on all the segments from the fourth to the eleventh, inclusive. The stigmata are black. The spines are light blue, and very minute. There is a red patch at each side of the anal legs. (See Plate VII, fig. 4.)

Pupa. { Full-fed. San Paulo, 28th Oct., 1879. / Imago, 3rd Dec., ,, } 36 days.

When full-fed the caterpillar spins a white silken cocoon on a stalk of grass or other suitable plant, and in this undergoes pupation.

Imago. { *a*, ♂ San Paulo, 1879. / *b*, ♀ Full-fed, 28th Oct., 1879. / Imago, 3rd Dec. ,, } 36 days.

The beautiful moth appears about five weeks after the caterpillar is full-fed.

Family Lasiocampidæ.

Genus Syssisphinx. Hübner.

XLIV.—Syssisphinx Molina.

Phalæna Molina, Cramer, Pap. Exot. iv., pl. 302, fig. E. F.

Larva. Not preserved.

I took one specimen of this caterpillar full-fed and walking on the ground, near San Paulo, on the 4th of March, 1879. It was green, and had four curious curved horns on the thorax.

Pupa. Not preserved.

The same day that I found the caterpillar it entered the ground for pupation.

Imago. { *a*, ♂ Full-fed, San Paulo, 4th March, 1879. / Imago, 3rd April, 1879. } 29 days.
b, ♀ San Paulo, April, 1882.

The moth appeared a month after the larva entered the ground.

Genus Mesotages. H. Sch.

XC.—Mesotages trilunula.

M. trilunula, H. Sch. Lep. Exot., pl. 81, f. 465.

Larva. Full-fed, March, 1881.

This remarkable caterpillar feeds on several kinds of grass, and also some kinds of "taquara," or native bamboo. It is covered with curious mossy hair, of a golden brown colour. The ends of the hairs are many of them flattened out like an oar.

Pupa. { Full-fed, 15th March, 1881. / Imago, 19th April, ,, } 35 days.

When full-fed the caterpillar spins a cocoon of silk and its own hairs, weaving the hairs into the fabric, and making the cocoon look remarkably like the caterpillar itself.

Imago. { Full-fed, 15th March, 1881. / Imago, 19th April ,, } 35 days.

The moth appears five weeks after the caterpillar is full-fed.

XXXIX.—Megalopyge fuliginosa, n. sp.

Megalopyge fuliginosa, n. sp.—Female. Dull fuliginous-brown, semi-diaphanous; forewing with an indistinct ochreous-grey spot at end of the cell, and a transverse submarginal slightly-waved band. Body olivaceous ferruginous-brown; antennæ white; front of head, palpi, and legs blackish. Expanse 2⅝ inches.—F. Moore.

Larva. Full-fed. San Paulo, March, 1881.

The caterpillar feeds on the Guava. It is very short and fat, and is covered with feathery hairs, black, white, and chestnut colour, beautifully blended. At the roots of the hairs are clusters of venomous spines with powerful urticating properties.

Pupa. Not preserved.

Pupation takes place within a tough cocoon, with a "trap-door" at the anterior end, which is flattened and carinated. It is surrounded by a thickly woven web, in which the hairs of the caterpillar are mixed. When the moth emerges, the skin of the pupa is left protruding from the orifice.

Imago. { *a*, ♀ Full-fed, March, 1878.
Imago, January, 1879.
b, ♀ January, 1879.

The moth appears ten months after the caterpillar is full-fed.

Genus Hyleria. Hübner.

LXIV.—Hyleria falcifera.

H. falcifera, Hübner, Samml. Exot. Schmett. ii., i., f. 1-4.

Larva. Full-fed. San Paulo, 24th February, 1880.

The caterpillar feeds on a species of Mimosa that is common, and often used for hedges near San Paulo. It is social in its habits, remaining in large clusters in a loosely spun web during the day, and separating to feed at night.

Pupa. Not preserved.

Pupation takes place within a gummy cocoon surrounded by a soft woolly web, and in their natural state probably the whole brood spin together in one mass, as I have found the broods of allied species in just such masses.

Imago. { Full-fed, 24th February, 1880. / Imago, 11th April, ,, } 46 days.

The moth appears between six and seven weeks after the caterpillar is full-fed.

Family Tineidæ.

Genus Endrosis. Hübner.

XCVII.—Endrosis Braziliensis, n. sp.

Endrosis Braziliensis, n. sp.—Forewing pale brownish-white, numerously covered with dark-brown scales, these brown scales forming a dark dentate streak at base of the cell, a small spot in middle of the cell, a similar spot beneath it below the cell, an irregular broadish transverse streak at end of the cell, and a streak along each vein towards extreme outer margin, these vein streaks being transversely confluent and thus form a series of pale oval marginal spaces; cilia pale brown, with dark brown spots. Hindwing ashy-grey; cilia pale brown. Head and thorax pale brownish-white, thickly interspersed with brown scales; abdomen brownish, naked; antennæ and palpi pale brown; forelegs blackish above, with pale tarsal bands; midlegs and hindlegs pale brown; middle tibia and tarsi with blackish bands; hind tarsi with blackish bands. Expanse, $\frac{5}{10}$ to $\frac{6}{10}$ inch.—F. Moore.

Larva. { *a*, Full-fed, San Paulo, June, 1882. / *b*, Long tubes formed by larvæ on dead bark.

This caterpillar was taken on the posts of my "rancho," at the Cantareira Waterworks, San Paulo, in May, 1882. It lives in a small chamber excavated in the dead bark of a tree, and from the mouth of this chamber it forms a long tube of silk and minute particles of bark. The tube is very soft and flexible, and the free end is very loose and baggy, forming an excellent covering for the caterpillar when

feeding. When the caterpillar is full-fed the tube is eleven centimetres in length, the diameter at the end attached to the bark is a little over a millimetre, and the free end between two and three millimetres. The caterpillar itself is only twelve millimetres in length when full-fed. It never leaves the tube, and is very timid, darting with wonderful rapidity into the chamber in the bark upon the least alarm. The head and first segment of the caterpillar are shiny black, the rest of the body being a dull semitransparent drab. The free end of the tube is generally lightly secured to the surface of the bark, so that when the caterpillar retreats into the bark the end is not blown away from the surface. I tried some experiments to see whether the caterpillar could in any way reach the bark from the open end of the tube, in case it should be blown loose. I raised the tubes about half-way down by bits of paper, leaving the mouths from half an inch to an inch from the surface. After a short time those that were only raised half an inch had attached themselves to the bark. As the caterpillar emerged from the chamber in the bark, and moved along the tube, the latter curved slightly inwards, so that the caterpillar was able when he reached the end to catch the surface with his legs, and draw the tube down to the bark. The curvature of the tube was so distinct that it suggested the idea of its being done intentionally, by the caterpillar pulling together the threads of the side of the tube next the bark; but I am inclined to think it was in reality only the effect of the weight of the caterpillar as he advanced. In those cases in which the tubes were raised three-quarters of an inch and an inch, the caterpillars failed to reach the surface of the bark. It is probable that the end of a tube very seldom does become loosened from the bark, and in case such an accident should happen, the caterpillar waits till the wind blows it against the bark, where the loosely woven fabric is very likely to catch.

I am informed by Mr. A. Libert, late of Trinidad, that he has seen similar tubes in that island.

Pupa. { *a*, Tubes on large piece of bark, swollen out in centre into bulb containing pupa.
b, Bulb cut open, showing pupa.
Full-fed, 13th June, 1882.
Imago, 2nd Sept., ,, } 81 days.

When the caterpillar is full-fed, it draws up the tube in the middle, and swells it out into a bulb five millimetres in diameter, in which it changes to the pupa state. The tubes are by this operation reduced from eleven to six centimetres in length.

On June 13th some of the caterpillars were full-fed, and preparations for pupation began. By June 27th nearly all the tubes had the bulbs formed, but pupation did not take place till later, for the caterpillars could still be traced darting into the bark if the tubes were disturbed.

Imago. { Full-fed, 13th June, 1882.
Imago, 2nd Sept., et seq. } 81 days.

The tiny moths appeared at the beginning of September. When they emerged they hid themselves in the cracks of the bark, and did not seem at all inclined to fly away. When touched they gave a kind of jump, and "shammed dead." By holding my "killing bottle" below them, and touching them on the head, I was able to kill them without any damage.

Explanation of Plate :—

Fig. 1. Amphonyx Tapayusa, n. sp., larva, p. 19.
,, 2. Aneurocampa Mingens, larva, p. 21.
,, 3. Automeris ophthalmica, n. sp., larva, p. 25.
,, 4. Attacus Jacobææ, larva, p. 28.

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